Science & Technology

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ROCHESTER, N.Y.

ROCK PRODUCTS AND THE QUARRY

OCTOBER, 1938

Medusa Installs New Type Dust-Collecting System . . . Originality of Design Revealed in California Gravel Plant . . . Lubricating Rock Drills . . . Modern Cement-Kiln Practice

"BEST SUCTION HOSE I EVER USED"

THAT'S how the superintendent of a large South Carolina sand and gravel company describes the many lengths of Goodyear Style M Sand Suction Hose, with cast iron flanged nipples built integral, being used throughout his plant.

And with good reason. Before changing to Style M Hose on recommendation of the G.T.M.—Goodyear Technical Man—200,000 to 250,000 yards of gravel was the maximum service from any hose used.

Now, with Goodyear Style M they are averaging from 400,000 to 500,000 yards—double the yardage of previous brands—with a service life of from three to five years depending upon the amount of gravel run.

This is typical of the money-saving service you get from all Goodyear Mechanical Rubber Goods—transmission and conveyor belting; air, water and suction hose—specified by the G.T.M. Why don't you put your tough problems up to this friendly adviser? To bring him to your plant, just write Goodyear, Akron, Ohio, or Los Angeles, California—or call the nearest Goodyear Mechanical Rubber Goods Distributor.

GTM-Specified
GOODYEAR STYLE M SAND SUCTION HOSE (smooth bore)
for heavy duty service
A
B
C
D
A — Extra heavy tube specially compounded to resist cutting action of sand
B — Rubber-impregnated duck "anchor" strip prevents tube from being drawn out by suction
C — Heavy wire spiral keeps hose from collapsing under suction
D — Multi-ply carcass of heavy duck with abrasion-resisting rubber cover.
Made in all sizes — lengths up to 50 feet
BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

THE GREATEST NAME IN RUBBER

GOODYEAR

Received 5 Times More Service from PROMAL Chain

OCT 5 - 1938
ROCHESTER, N.Y.

● This bucket elevator handled hot fuller's earth at the plant of the Fuller's Earth Co., Midway, Fla. The service was extremely severe. The malleable chain with which it was formerly equipped, usually had to be replaced about every 12 months.

In 1931 this elevator was equipped with Promal chain. It operated constantly in day-and-night service from that time until last October, when the plant was closed down. In the opinion of the management of this company, it still has many more years of service left in it.

For real economy, long life and durability, try Link-Belt Promal chains and buckets on your severe service elevators and conveyors.

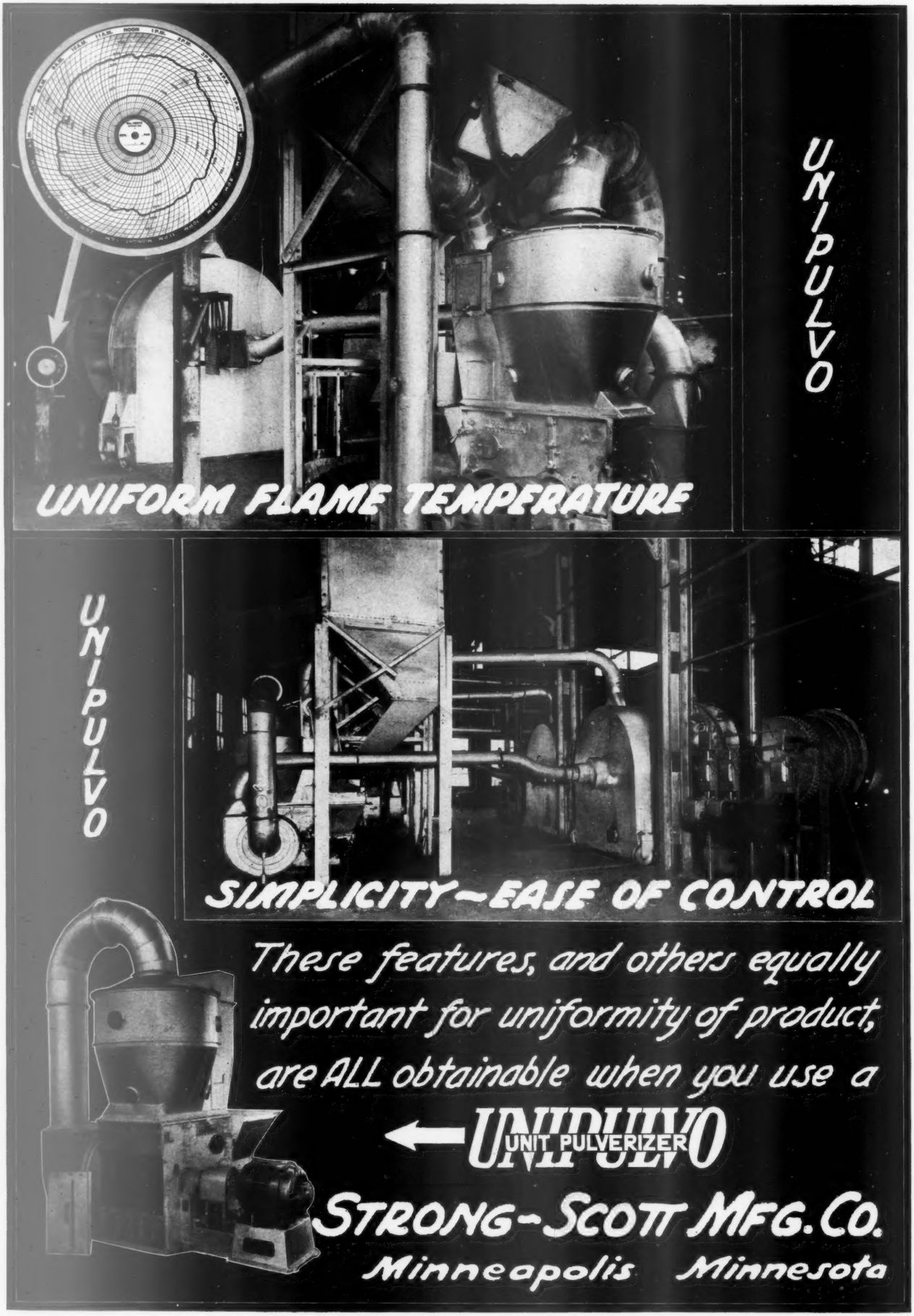
Link-Belt Company, Indianapolis, Chicago, Philadelphia, Atlanta, San Francisco, Toronto, or any of our other offices, located in principal cities.

7511

THE SYMBOL OF QUALITY · LB · LINK-BELT

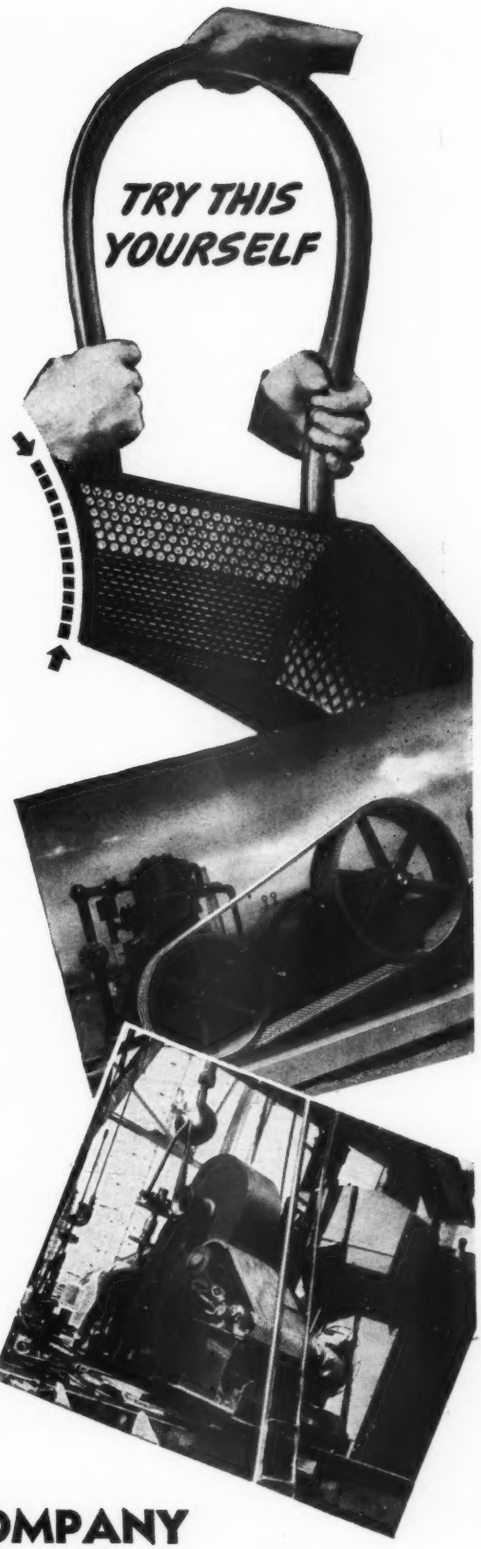
LINK-BELT
PROMAL Chains and Buckets

PIT AND QUARRY, October, 1938. Vol. 31, No. 4. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada, Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter February 28, 1932, at the Post-Office at Chicago, Ill., under the act of March 3, 1897.


UNIPULVO
UNIFORM FLAME TEMPERATURE
UNIPULVO
SIMPLICITY—EASE OF CONTROL
These features, and others equally important for uniformity of product, are ALL obtainable when you use a
UNIPULVO
UNIT PULVERIZER
STRONG-SCOTT MFG. CO.
Minneapolis Minnesota

Bend ANY V-Belt FEEL its sidewall CHANGE shape

Then You'll See WHY it pays to Use V-Belts with the Concave Side



You can easily *feel* the sides of any V-belt change shape as it bends. The top of the belt is under tension and *narrows*. The bottom, under compression, *widens*. Figure 1, below shows the resulting shape-change in a straight-sided belt. Note the out-bulge of the sides.

Now look at figure 2. The same change of shape merely *straightens* the concave side, producing a contour that *precisely* fits the sheave groove. Two big economies result: (1) No out-bulge at the side means uniform wear—*longer life!* (2) Full sidewall grip on the pulley holds heavier loads without slippage—a big increase in drive efficiency—saving belt wear and also saving *power!*

The Gates Vulco Rope is the only V-Belt built with the patented concave side.

Engineering Offices and Stocks in All Large Industrial Centers

THE GATES RUBBER COMPANY

Factory Branches

Terminal Building
Hoboken, N. J.

1524 So. Western Ave.
Chicago

741 Warehouse St.
Los Angeles

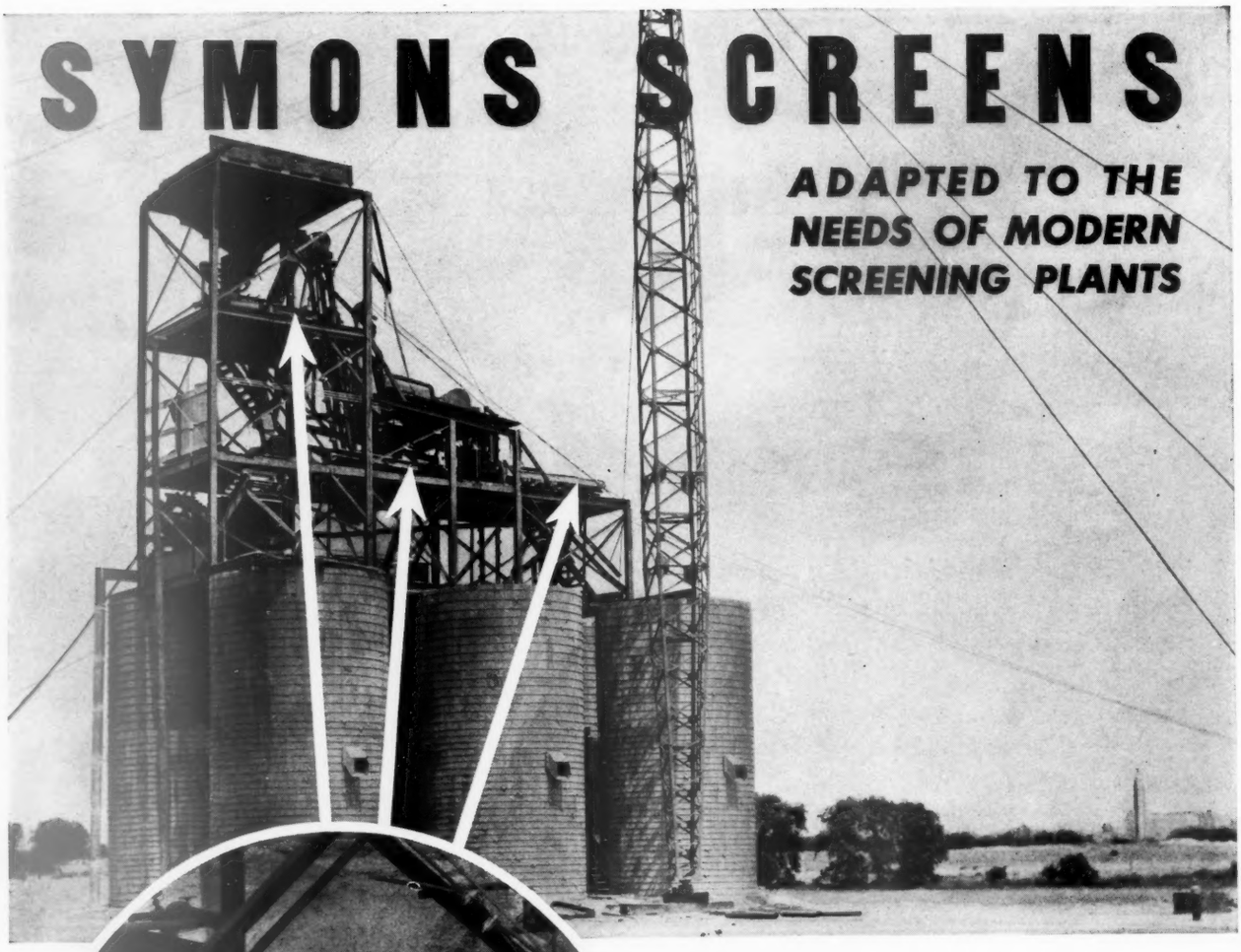
2213 Griffin Street, Dallas

999 South Broadway, Denver

GATES VULCO ROPE DRIVES

SYMONS SCREENS

ADAPTED TO THE NEEDS OF MODERN SCREENING PLANTS



In addition to the 3′ x 8′ double deck Symons Screen with vibrating discharge shown above, there are two more Symons Screens installed here—2′ x 6′ and 3′ x 12′, both double deck.

Many innovations in design and construction are to be found at the gravel plant of the Crown Building Supply Company at Columbus, Ohio. In keeping with its modern features, three Symons Screens are being used for the screening operations. With these flat screens, it is possible to secure the closer sized and better washed materials as are specified today, furthermore, being placed level, they materially reduce headroom, building height and construction costs. With a definite trend toward flat screening, Symons Screens have many advantages of interest to those contemplating a new plant or a modernization program.

NORDBERG MFG. CO. MILWAUKEE WISCONSIN

New York City
60 E. 42nd St.

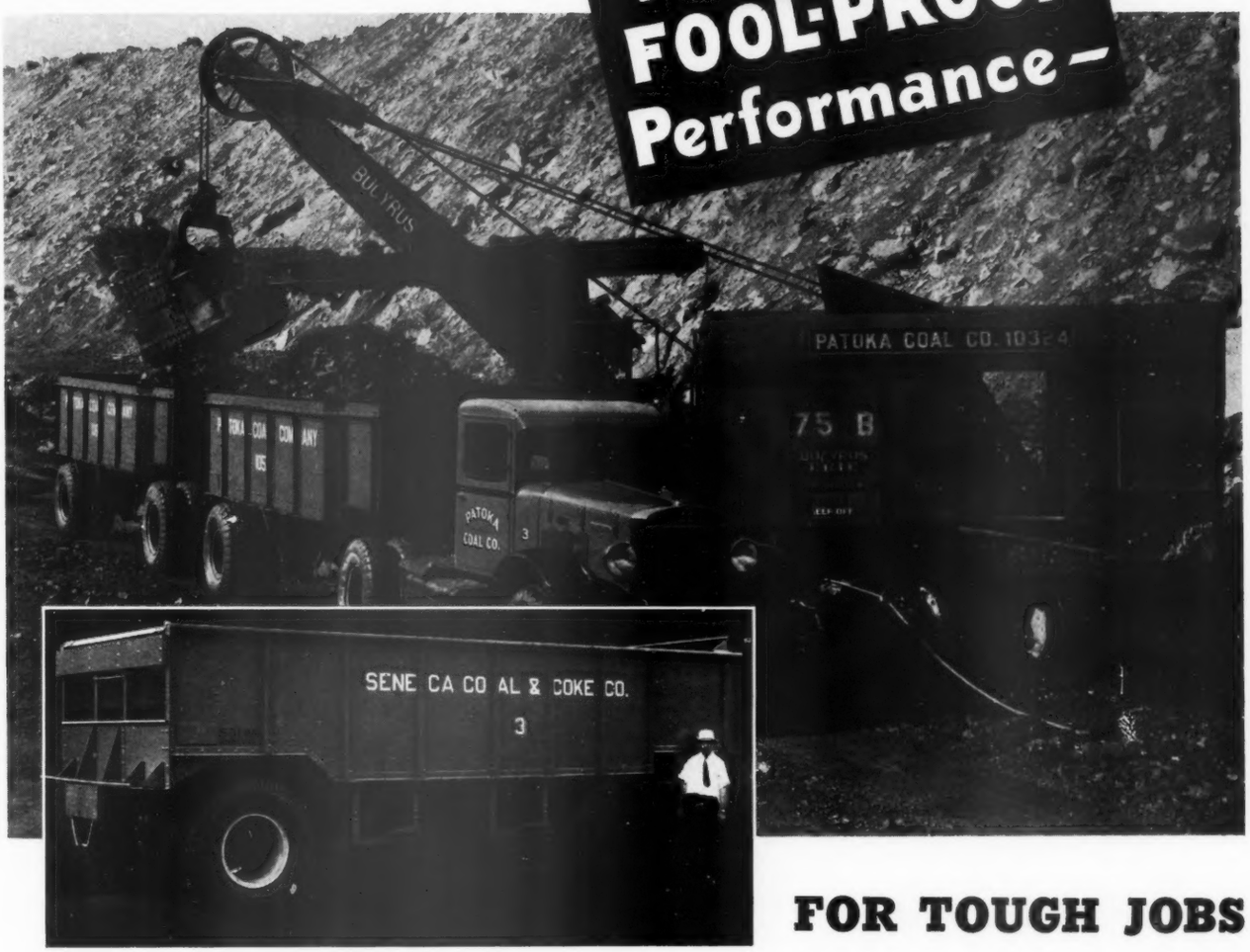
Los Angeles
Subway Terminal Bldg.

Toronto
Concourse Bldg.

London
Bush House

Investigate it—

For FAST FOOL-PROOF Performance—



FOR TOUGH JOBS

S-D AUTOMATIC BOTTOM-DUMP TRAILERS

What do you want most in any piece of mechanical equipment? Aside from the fundamental requirements of sturdy construction, isn't it simplicity? Well, you'll get it in Sanford-Day's Automatic Bottom-Dumping Trailer . . . it's free of complicated fixtures, "what-nots" and "gadgets." No stop-and-adjust time wasting with this trailer. With 35 years' experience in building all types of mine cars . . . and as pioneers in manufacturing automatic drop-bottom cars, we know what it takes for fast, uninterrupted, fool-proof performance.

S-D "Automatic" Bottom-Dump Trailers are built for the TOUGH JOBS. Doors are tripped automatically as trailer reaches the hopper or storage bin . . . and closed automatically by the simple movement of the trailer as it leaves the hopper . . . no manual operation of any kind.

The close-up of the trailer shown above is a 25 Tonner . . . and it is handled like a baby carriage. What capacity do you need? Let one of our engineers give you the complete story . . . let him tell you why S-D "Automatic" Bottom-Dump Trailers will give you faster, fool-proof and more economical Service.

SANFORD-DAY IRON WORKS, 611 Dale Ave., Knoxville, Tenn., U. S. A.

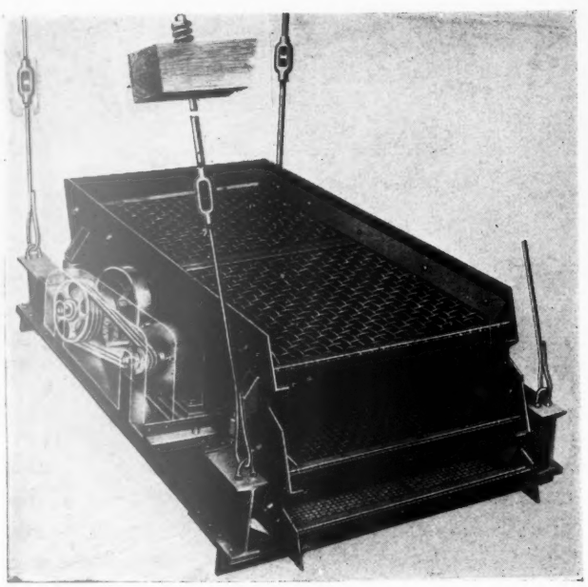
MINE CARS, ALL TYPES • TRAILERS • WHEELS • SHEAVES

For CAPACITY Plus ACCURACY in Classifying Materials

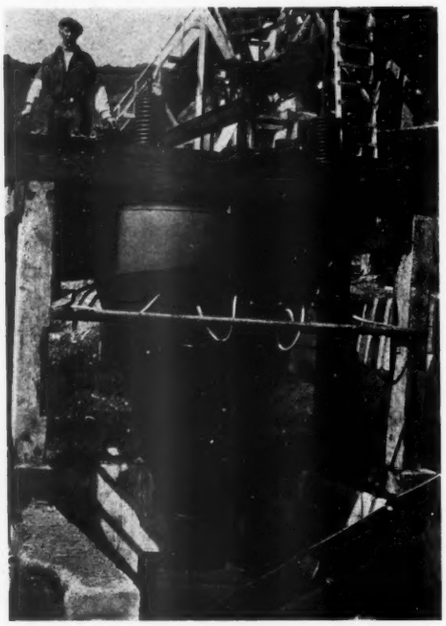
KENNEDY
VIBRATING SCREENS

You can keep your tonnage up and get the most accurate sizing with a Kennedy Vibrating Screen. These rugged units are built to stand the hardest service with a minimum of repairs.

The Kennedy Vibrating Screens for coarse or fine screening are available in 1, 2, 3, or 4 decks and in sizes to handle any capacities. They require little headroom and may be suspended or mounted on stationary supports.



KENNEDY
WASHING CLASSIFIERS



The Kennedy Cone serves three purposes in one. It can be used as a Classifier to separate materials to any degree of fineness desired, as a Dewaterer to considerably lower the moisture content of material, and as a Washer to clean a wide variety of products.

The Kennedy Classifiers require no motors and have no wearing parts, which minimizes both original and maintenance costs. These units are being used for the production of Concrete and Mason sand to meet the most rigid state specifications.

Our Engineering Staff will gladly make recommendations for a solution to your problems.
Write on your letterhead for a copy of our new Bulletin No. 35, 2nd Edition—It's just off the press!

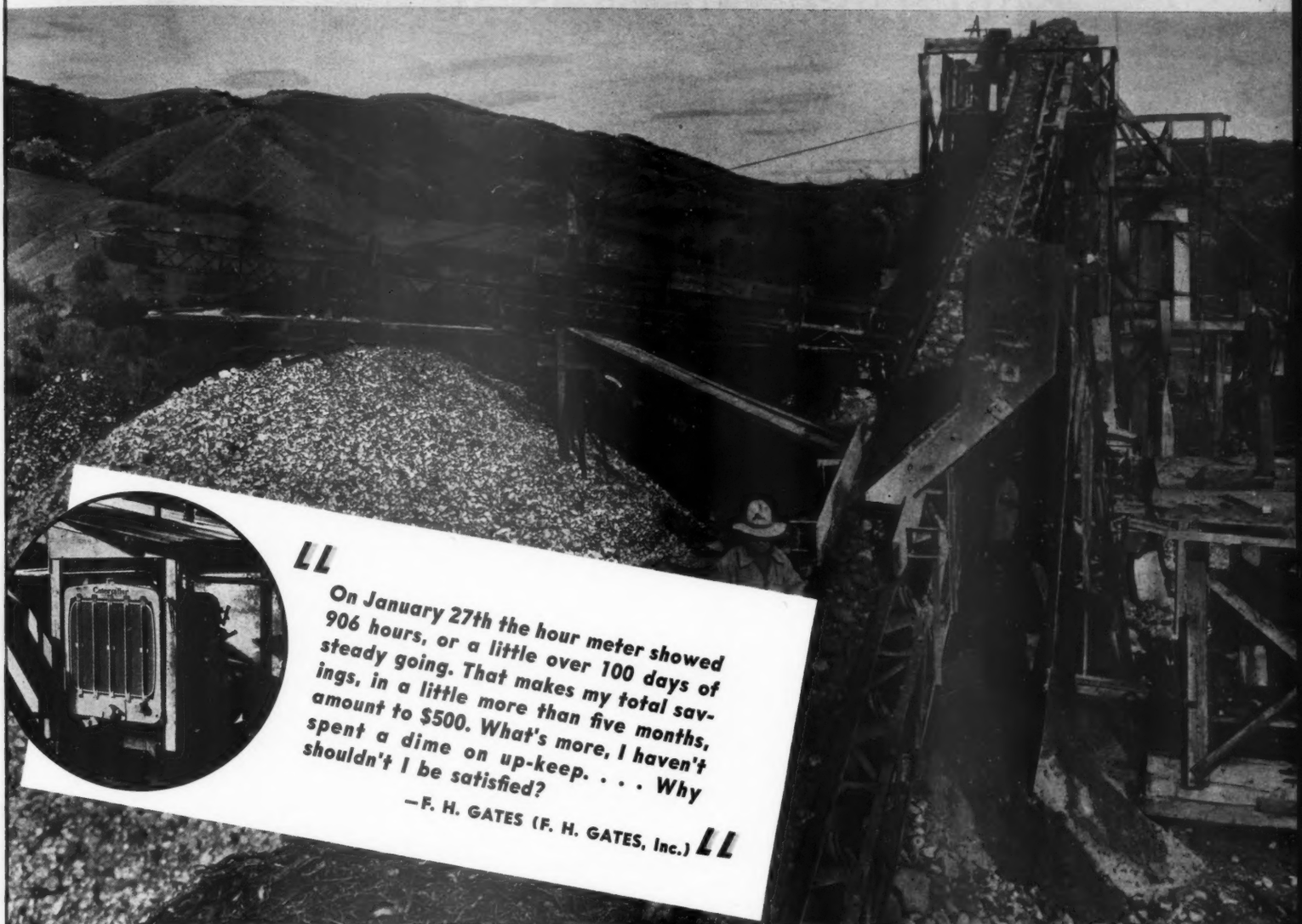
KENNEDY-VAN SAUN

MFG. & ENG. CORPORATION

TWO PARK AVENUE NEW YORK, N. Y.

MONEY

TELLS THE STORY



"On January 27th the hour meter showed 906 hours, or a little over 100 days of steady going. That makes my total savings, in a little more than five months, amount to $500. What's more, I haven't spent a dime on up-keep. . . . Why shouldn't I be satisfied?"

—F. H. GATES (F. H. GATES, Inc.)

FIVE HUNDRED DOLLARS saved in five months on operating costs, with his 80-horsepower "Caterpillar" Diesel Engine! . . . How does the owner of this gravel plant arrive at this figure? By comparing his present fuel costs with those of the gasoline engine he formerly used for the same work. With his "Caterpillar" Diesel consuming only 3½ gallons of 6¾c fuel per hour, a saving of approximately $5 a day has been effected. And while this engine is still "young" and its upkeep record has been an exceptional one to date, it nevertheless indicates that with normal care "Caterpillar" Diesel Engines do offer long, dependable performance at very low average expense for maintenance and repairs.

The Gates plant is a Stephens-Adamson portable, with the "Caterpillar" Diesel driving a 4x20 rotary washer, a 9x36 jaw crusher, and 5 conveyor belts totaling 350 ft. Location, about ten miles west of San Miguel, Calif. Average daily production, 600 cu. yds.

This is just one of many instances of modern "Caterpillar" Diesel Engines supplanting other types of power on pit-and-quarry work throughout the world. They are adaptable to all kinds of equipment: Operating crushers, screens, washers; compressors for rock-drilling; shovels and bulldozers for removing overburden; cranes for loading; tractors and locomotives for hauling . . . and are backed by the most complete parts-and-service facilities of any engine manufacturer in the world.

NINE SIZES—32 TO 160 HORSEPOWER

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR DIESEL POWER

REG. U.S. PAT. OFF.

DIESEL ENGINES • TRACK-TYPE TRACTORS • ROAD MACHINERY

These Lines should be PRE-FORMED *for* ECONOMY

UNION recommends pre-formed rope only where conditions are such that pre-formed will **SAVE MONEY!** Its initial cost is slightly higher — therefore we recommend its use mainly where bending is severe. Under severe bending, pre-formed stands up so <u>much</u> longer that it far more than repays its extra cost.

This is because, being free from internal stresses, it is much slower to fatigue under the externally applied stresses of constant bending.

"UNION-formed" Rope (our superior pre-formed product) will bring substantial savings when used for holding and closing lines on clamshell buckets; hoist rope, crowd rope, and rack rope on shovels; hoist and drag lines on dragline machines; all ropes for tractor-drawn wagon scrapers; hoisting ropes for cranes; operating ropes for concrete chutes and towers, — and wherever ropes are in constant operation over small sheaves or with reverse bends.

Reduce rope expense by using the strictly correct rope for each service. Secure the expert recommendations of our local distributor or of our engineering staff.

UNION WIRE ROPE CORPORATION

General Offices and Factory: 21st and Manchester, Kansas City, Mo.
Chicago District Office and Warehouse: 431 West Pershing Road,
Telephone Yards 1659
Portland, Ore.: 2415 N. W. 22nd Ave.
In Mexico: E. O. Chapa, Calle Damas Sur 13, Tampico—Madero 2, Mexico D. F.
Export Agents: Lucey Export Corp. (Exclusive)
3505 Woolworth Bldg., N. Y. Broad St. House, London, E. C. 2, England
Distributors in Leading Cities throughout the Country

UNION WIRE ROPES

The "ULTIMATE LOW COST WIRE ROPE"

union PRE-FORMED

UNION WIRE ROPE CORP

DEMPSTER

DUMPSTER

1 LOADING—Ready for pick-up by truck. Note material is handled at "shovel level" instead of pitching it over side-boards of truck.

TRANSPORTING up[illegible]k unit. All of load carried on chassis; no [illegible]erhang; no counter-weights.

DUMPING—One-man control. Load spotted anywhere and instantly dumped by simply pulling a lever. "Minute-stops" for dumping means fast trucking. **3**

Center suspension
No counterweights

2

No overhang
No sidesway

WHY forfeit profits by using costly time-wasting methods of material handling!

Throw off the chains of inefficiency and speed up the work with Dempster-Dumpster equipment. This modern system of hand loading often saves as much as 30% to 50% in quarry operations, road building and construction jobs.

It takes the high cost and hard work out of material handling. Detachable containers are spotted at loading points, and picked up as fast as filled by the automatic hoisting units, then hauled and dumped in rapid succession.

New Model "LF"—Center Suspension Type

This latest development in the Dempster-Dumpster hoisting unit lifts the entire load upward and forward on the chassis. The support point is at the center of the truck. No counterweight is needed for the load, and there is no overhang or sidesway to the detachable container.

Model "LF" gives increased capacities to small trucks and will carry a 2 cu. yd. container on a 1½ ton truck. It insures lowest costs on long hauls, and can also be used on short hauls in the same manner as the standard type "rear carry" Dempster-Dumpster.

Model "LF" is a dual purpose Dempster-Dumpster—the outstanding development of today in material handling equipment.

Write for Bulletin

DEMPSTER BROTHERS, Inc. KNOXVILLE TENNESSEE

KOEHRING

IN THE QUARRY

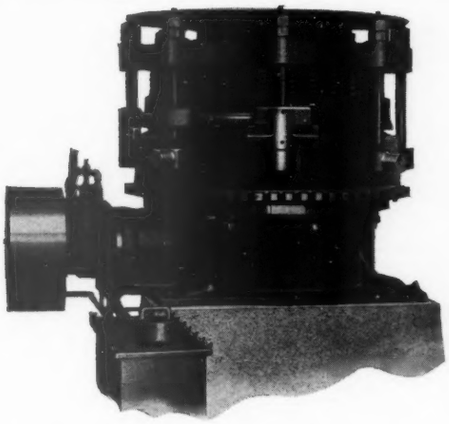
Write for New Catalog No. 233 for Complete Information Featuring Construction Details and Application.

High strength steel, wear-resisting crawlers and shoes, rugged all-welded boom, easy-filling and quick dumping dipper are highly important service qualifications of a quarry shovel. These features and many others are built into Koehring Shovels. This 3/4 yard Koehring Shovel is proving its worth in tough quarry work.

KOEHRING COMPANY
CONSTRUCTION EQUIPMENT • MILWAUKEE, WISCONSIN

Plus PERFORMANCE *minus* MAINTENANCE

finer crushing—a more cubical product



TELSMITH GYRASPHERE CRUSHER

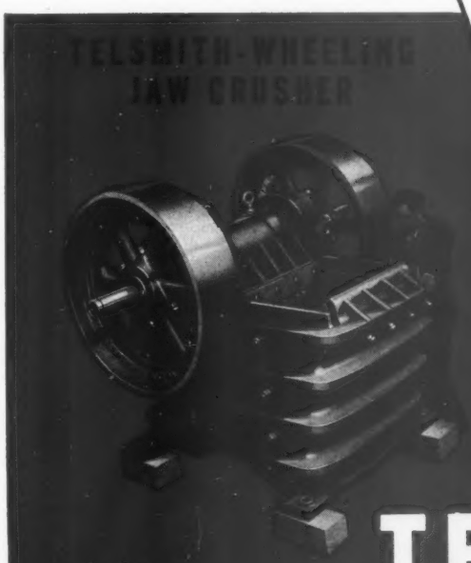
takes an unlimited and unregulated choke feed when other secondary crushers can't. Like a mortar and pestle... only inverted for easy discharge ... the spherical head and its corresponding concave catch and break chunks of rock between two multi-curved surfaces—a perfect *cubing* action. A finer, faster secondary crusher that takes less power ... and less up-keep. *Write for descriptive Bulletin Y-15*

higher speed and greater tonnage

better built for longer life and lower up-keep

You get more crushing strokes per minute with the Telsmith-Wheeling Jaw Crusher... and greater reduction in *one* process. Roller bearings almost double capacity, cut power consumption per ton, reduce up-keep. Because its frame and jaw are massive steel castings, its shaft a big steel forging—Telsmith is almost a permanent investment. Adjustable for a wide range of product sizing. Seven sizes. *Write for Bulletin W-15.*

Sand, gravel, crushed rock, ore, coal—Telsmith Pulsator screens 'em all, wet or dry, and does it *right.* Its circular movement produces a maximum screening action that's *uniform* on every inch of the wire, regardless of load. Telsmith builds in greater value, longer life and lower up-keep with the toughest alloy steels, anti-friction bearings and special seal protection for working parts. Single, double or triple deck; 11 sizes. *Write today for Bulletin V-15.*



TELSMITH

SMITH ENGINEERING WORKS, 504 EAST CAPITOL DRIVE, MILWAUKEE, WIS.

MORE HOLES PER SHIFT WITH TIMKEN ROCK BITS

Mine operators can get more holes per shift at lower cost with TIMKEN Bits due to faster drilling; more footage per bit; less tramming; no waiting for steel at working face.

The design of the TIMKEN Bit and the material from which it is made—TIMKEN Electric Furnace Steel—assures (1) faster penetration by making possible an even distribution of the drill blows through the bit. (2) protection of the threads against injury. (3) reduced steel breakage.

The streamlined construction of the TIMKEN Bit permits holes to be blown out cleaner, thus making it easier to withdraw the steel.

TIMKEN Bits have been adopted by some of the world's largest metal mines with large savings for the operators. It will pay you to use them.

TIMKEN Bearings are used on all locomotives and many of the cars of the new 20TH CENTURY LIMITED

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; TIMKEN Rock Bits; and TIMKEN Fuel Injection Equipment.

TIMKEN
ROCK BITS

ANOTHER WIDE AWAKE SANDMAN! Cuts Costs with a CONTINENTAL

and Gets Out 800 Yards Daily!

This South Dakota sand and gravel producer uses a 4 yd. Continental Wagon Scraper and a Model "K" Allis-Chalmers tractor in his pit.

The Continental digs, loads and hauls in one operation while it's on its way to the grizzly dump box. Traveling over 350 feet per round trip, the Continental keeps way ahead of the crushing plant equipped with a 8" x 36" jaw and secondary roll crusher with a capacity of 75 to 100 yds. of sized gravel and sand per hour. Even in wet weather, the scraper gets 80% loads and so keeps ahead of the crushing operation.

This operator reports that the Continental is supplying his crushing plant at a far lower cost per yard than is possible with other dig and haul equipment; and he has fewer tractors and less equipment to maintain, all of which adds up to big savings.

Additionally, the Continental strips the overburden, built the approach to the grizzly and made the road into the pit, cutting costs still further at this operation.

Sand and gravel producers in many States have found that Continentals cut their digging and hauling costs up to 50%. What about your pit? Are outmoded methods robbing you? Get the complete Continental story; see for yourself what other operators have done with Continentals.

Made in 4, 5, 7 and 10 yard sizes mounted on low pressure tires or crawlers complete with easily operated hydraulic power control and Be-Ge Pump Unit for rear power take-off.

Sold and serviced by Allis-Chalmers dealers everywhere!

NEW LOW PRICES effective Sept. 20, 1938

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY

Tractor Equipment Division
14400 Railroad Avenue
East Chicago, Indiana

CONTINENTAL WAGON SCRAPERS

There's still time to Catalog your product! ... write for Rates and Reservations

Here's Your Market for 1939

Pit and Quarry HANDBOOK offers you 100% sales coverage for all of the coming year—a year that business leaders say will continue the sensational come-back for the heavy industries.

Housing programs, road building, land development projects and government construction on a huge scale, all point to an unprecedented demand for basic materials.

As the one and only Directory of all *producing plants* and *purchasing personnel* in the cement, gypsum, lime, sand, gravel and crushed stone fields, the HANDBOOK is the key to your advertising campaign.

List your entire line in this Buying Manual of the Pit and Quarry Industry—and your sales message will go to every prospect who authorizes or approves purchases in the 5,100 producing plants in the industry.

This is your logical market and your 1938 advertising will not be complete unless you include a page or series of pages in the HANDBOOK to catalog your products.

Act now, before the closing date of publication makes you miss your market.

PIT AND QUARRY PUBLICATIONS
538 SOUTH CLARK ST., CHICAGO

BUCYRUS ERIE

up-to-the-minute 20-B

- new, positive, independent, twin-rope crowd
- automatic lubrication . . . all gears run in oil
- power rides free on 37 anti-friction bearings
- speedlined transmission . . . short-cut for power
- two-speed propel . . . sharp turns or long curves
- positive traction brakes . . . no blocking of cats

● Get the big, 32-page bulletin which illustrates these and many other money-making, money-saving features of the new 20-B.

BUCYRUS-ERIE

SOUTH MILWAUKEE, WISCONSIN, U. S. A.

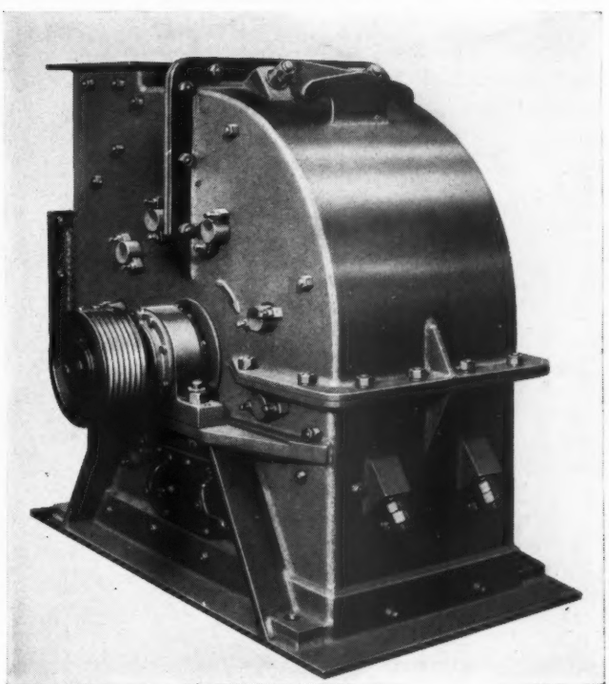
SAVE ON SERVICE COSTS WITH MULTI-IMPACT PULVERATORS

Allis-Chalmers Pulverators Reduce Wear on Hammers and Grates . . . Eliminate Power Waste!

Here's how to switch from red ink to black! Here's how to cut production costs by reducing maintenance costs . . . with Allis-Chalmers MULTI-IMPACT Pulverators!

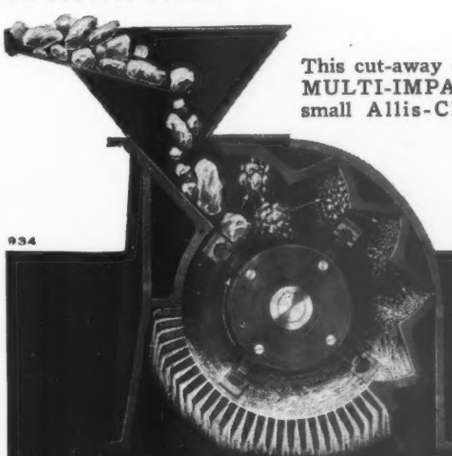
You can get bigger profits with Allis-Chalmers Pulverators because service costs have been cut to a minimum. MULTI-IMPACT action reduces wear, both on hammers and on grates* . . . replacements are less frequent. Hammers are reversible, giving double wear, and detachable from the arms. And you can replace hammers without extra cost for new arms. All wearing surfaces in MULTI-IMPACT Pulverators are protected by rugged wear-resisting liners. Large anti-friction bearings in dust-tight housings further reduce power and maintenance expense.

Find out how Allis-Chalmers MULTI-IMPACT Pulverators can save you money by reducing service costs. Get the whole story. There's an Allis-Chalmers engineer in the district office near you who can show you how to get bigger profits . . . by saving on service costs!



A MULTI-IMPACT Pulverator, feed throat opening 11½" x 25". Pulverators are built in seven sizes, with feed openings from 4½" x 9" to 11½" x 49".

*In Allis-Chalmers MULTI-IMPACT Pulverators, most of the work is done in the upper part of the machine. The hammers revolve upward to shatter the material to be crushed, hurling it against a series of involute breaker plates for further reduction. By the time the material reaches the bottom, most of it is fine enough to go through the grates. That's the reason *why* drag is lessened . . . *why* wear is reduced . . . *why* you can save on service costs!



This cut-away drawing shows MULTI-IMPACT action in a small Allis-Chalmers unit.

934

CRUSHING · CEMENT AND MINING DIVISION

ALLIS-CHALMERS

MILWAUKEE · WISCONSIN

The Wire Rope of today

. . . and tomorrow . . .

The new Gilmore Wire Rope is so much different than any you have ever used that it should sell for a lot more—but it doesn't. Every machine in this great new J & L plant is a precision machine.

Every approach towards perfection is embodied in these new ropes . . . no interstices to receive grit . . . no painted strand because you cannot lubricate a strand and paint it . . . neither can anyone else, so we think you prefer to have it lubricated. . . . Every Wire, Strand, Rope and lay, precision built to 1/1000 of an inch—and so many other improvements, we think you should write us for further information . . . and . . . let us have your inquiry for the next replacement —then make a critical comparison.

Other J & L Steel products:

Standard Pipe in seamless and welded—Seamless Steel Boiler Tubes—Hot Rolled Shapes—Abrasion Resisting Plates—Bar mill products including Bars for Concrete Reinforcement—Bar size shapes—Track Spikes—Wire Nails and Spikes—Galvanized Sheet Steel Roofing and Siding —Woven Wire Fencing—Barbed Wire—Soft Annealed Wire.

GILMORE
WIRE ROPE DIVISION

MUNCY · PENNSYLVANIA

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH PENNSYLVANIA

J&L STEEL

THEW CENTER DRIVE

Rock-Worthy

● There are few shovels that thrive on an all-rock diet, but loading out 26-yd. cars of limestone to feed a 48-inch crusher is just so much meat to this Lorain-87 Diesel of the Bessemer Limestone & Cement Co., Bessemer, Pa.

There is always plenty of rock on tap at the crusher when Lorains are working in the pit, for here are shovels that can stand the gaff. They are rugged in construction; have direct high-efficiency power transmission; and are equipped with new type boom constructions which are designed accurately for torsion as well as bending and compression stresses.

If it's big production with economy that you are after, write today for catalogs describing Lorains. You will find them mighty revealing as to what real rock shovels have to offer.

THE THEW SHOVEL COMPANY • LORAIN, OHIO

LORAINS 3/8 to 2 YD.

You are cordially invited to attend

The

Twenty-third Annual Convention and Exposition

NATIONAL SAND AND GRAVEL ASSOCIATION

• • •

Ninth Annual Convention and Exposition

NATIONAL READY MIXED CONCRETE ASSOCIATION

NETHERLAND PLAZA HOTEL

CINCINNATI, OHIO

JANUARY 25, 26 AND 27, 1939

The program will be a practical one devoted to the practical problems of the two industries. All who are interested in sand and gravel and ready mixed concrete are cordially invited to be present.

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Munsey Building Washington, D. C.

Removing Overburden—One of three L-O tractors and Continental scrapers used by L. A. Wood Company for stripping overburden and hauling barytes clay at Sweetwater, Tennessee.

FASTER POWER STRIPS DOWN 30 FEET

Much in demand for the manufacture of phonograph records, tooth powder and white paint is barytes, a heavy, whitish metal, mined by L. A. Wood Company at Sweetwater, Tennessee. There three Continental scrapers and the FASTER POWER of Allis-Chalmers tractors remove 30 feet of overburden and then transport much of the barytes-laden clay from pit to plant. Most of the time these outfits operate 24 hours a day over steep grades, do an economical job because:

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2. They haul **MORE LOADS FASTER.** A-C Oil Engines start instantly and go right to work—you gain from 1 to 3 loads per shift on starting time alone. More and higher working speeds give you a right speed for every need from lugging up steep pit ramps to high gear traveling on the level. Quick pick-up and easy handling save trip-gaining seconds getting into and out of the pit, swinging about on the dump.

3. They **UNLOAD FASTER.** Continental scrapers end dump like a truck, thus enable you to place overburden where you want it without a second handling.

Ask your Allis-Chalmers dealer how this outfit can cut your stripping and material handling costs and at the same time take care of such other jobs as building hauling roads, digging drainage ditches, clearing slides, etc.

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TRACTOR DIVISION—MILWAUKEE, U. S. A.

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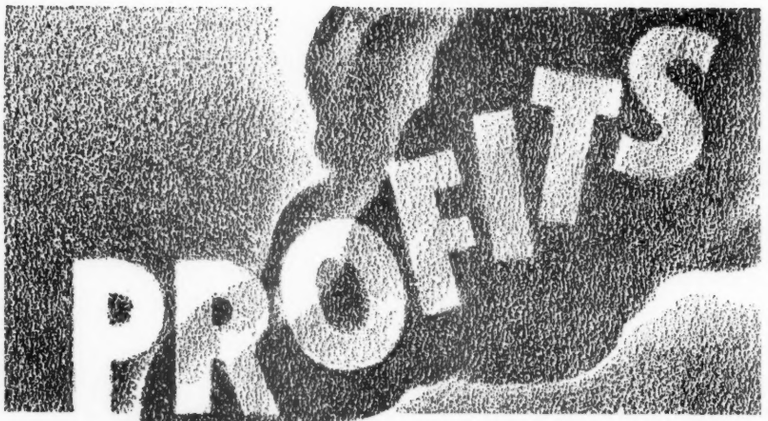
OIL TRACTORS



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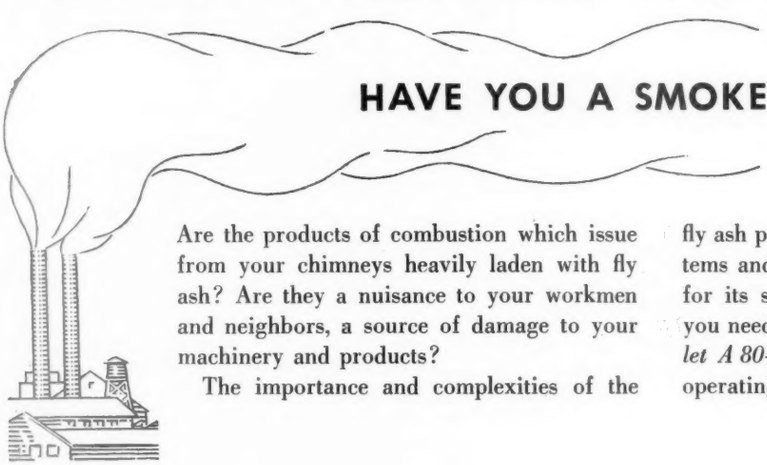

HAVE YOU A SMOKE PROBLEM?

Are the products of combustion which issue from your chimneys heavily laden with fly ash? Are they a nuisance to your workmen and neighbors, a source of damage to your machinery and products?

The importance and complexities of the fly ash problem are reflected in the many systems and devices which have been developed for its solution. To help you evaluate these you need the data and explanations in *Booklet A 80*—free to any managing executive or operating engineer.

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SUITE 5000, 12 CEDAR STREET, NEW YORK

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SALES OFFICES IN PRINCIPAL CITIES

PIT AND QUARRY

Vol. 31 October, 1938 No. 4

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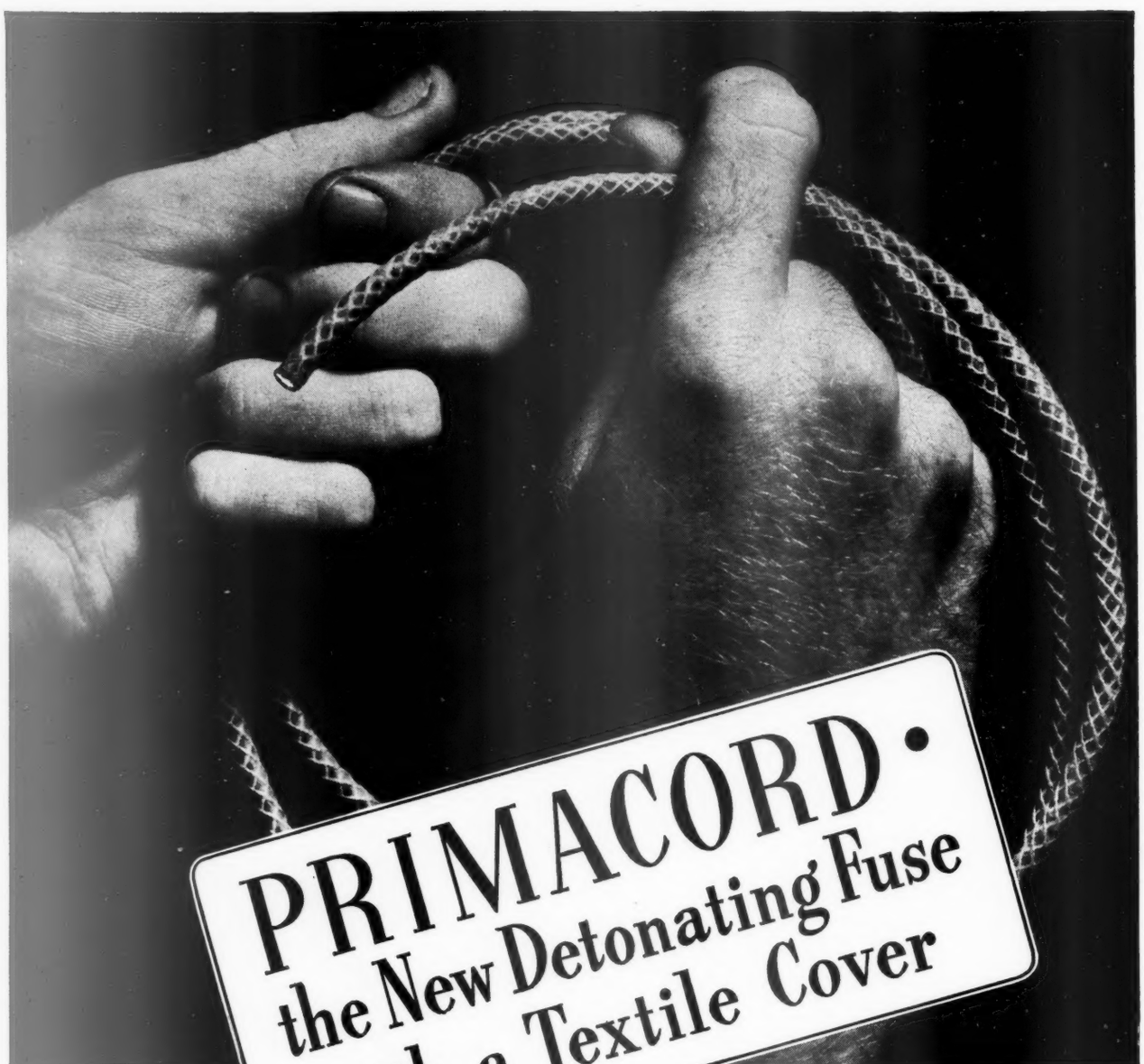

PRIMACORD • the New Detonating Fuse with a Textile Cover

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As one good thing leads to another, Cordeau has led to Primacord, a new detonating fuse of even greater speed and ease of handling. It has a core of PETN, a powerful detonating agent with an explosive wave of 20,350 feet per second—almost 20% faster than Cordeau. Due to its special textile covering, which combines greater flexibility and minimum weight with suitable strength and waterproof qualities, it is easier to handle and speeds up operations.

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Makers of Cordeau-Bickford Detonating Fuse

PRIMACORD-BICKFORD *Detonating Fuse*

U. S. Gypsum Co. to Build Florida Plant

ON JACKSONVILLE WATERFRONT

Plans for the erection of a new and completely modern plant near Jacksonville, Fla., to aid in servicing the growing southern building market were announced in September by the United States Gypsum Co.

The new plant will embody new and distinctive advancements in design, construction and equipment which the research and engineering departments of the company have originated and perfected. The location was carefully selected after long study, because of the splendid facilities available with respect to transportation, power and labor.

The property will be situated adjacent to docks where company boats will deliver gypsum rock from the company's quarries for the manufacture of a complete line of gypsum boards, gypsum plasters and other gypsum building materials.

The established plant at Plasterco, Va., will continue in operation, with the new plant at Jacksonville providing the additional capacity which the growth of southern business is making advisable, the company reports.

First Cement-Soil Road Is Laid in Kentucky

Seven miles of cement-soil stabilized road, the first of its type to be built in Kentucky, are under construction near Whitesville, Ky.

Construction is being supervised by H. A. Humphrey of the development bureau of the Portland Cement Assn., Chicago.

Central Silica Spends $65,000 for Equipment

An improvement program involving the expenditure of about $65,000 for new equipment is in progress by the Central Silica Co. of Zanesville, O. More than half the work has already been done and the remainder will be completed some time next year.

The company is affiliated with the Ayers Mineral Co., also of Zanesville, operating eight or nine plants in Ohio.

Experimental Magnesite Plant at Grand Coulee

The Northwest Magnesite Co. of Chewelah, Wash., together with the U. S. Bureau of Mines and Washington State College, will erect a $50,000 experimental plant at Chewelah to develop the magnesite industry with power from Grand Coulee Dam, according to an announcement by Earl A. Garber, president.

Road Builders to Meet at San Francisco

The 1939 American Road Builders' Assn. convention and highway exhibit will be held in San Francisco during the early part of March, 1939.

The exhibition will be staged in the spacious civic auditorium. The latest in road-building equipment, materials and methods will be displayed and dramatized for the show visitors. The convention and highway exhibit takes place soon after the opening of the Golden Gate Exposition.

Adds Clinker Coolers at Bath Cement Plant

The Keystone Portland Cement Co., Bath, Pa., is installing two Fuller Co. clinker coolers on two of its four kilns. The integral coolers have been taken off of these kilns adding about 40 ft. to their length with an increase of about 20 per cent. in burning capacity.

A new laboratory is also under construction which will be temperature controlled and air conditioned with an underground moist-storage room. A new locker building for employees is also being built.

Construction Awards Highest in a Year

AIDED BY NEW P.W.A. GRANTS

The largest volume of construction contracts since July, 1937, was awarded in the 37 eastern states during August, according to F. W. Dodge Corp. The month's total of $313,141,000 represented increases of 12 per cent. over August of last year and 30 per cent. over July of this year. Both privately-financed and publicly-financed projects increased over the preceding month, and the August construction total of nine out of fifteen districts ran ahead of the corresponding district totals of August, 1937.

In all fifteen districts, August residential contracts ran ahead of August, 1937, and produced the largest national residential total since April, 1937. Residential awards for the month amounted to $99,632,000, being a 36 per cent. increase over August of last year and a 13 per cent. increase over July of this year. Since the volume of small-house construction began to increase over last year as early as last May, and since total residential building was 7 per cent. over last year in July, the August record was a continuation and confirmation of a definite upward trend.

The new Federal public works program made itself felt in the August total for public works and utilities, amounting to $125,093,000, which was 40 per cent. ahead of the August, 1937, figure and 60 per cent. ahead of the July, 1938, figure. Non-residential building, with an August total of $87,316,000, ran 20 per cent. ahead of the preceding month, although it lagged 26 per cent. behind August, 1937.

It has been announced that the Alsen, N. Y., wet-process plant of the Lehigh Portland Cement Co. will be converted to the dry process, a reversal of the trend in recent years. Details of the rebuilding of this plant and the one at Union Bridge, Md., were published in a recent issue and remain unchanged.

Safety Congress at Chicago Oct. 10-14

CEMENT-QUARRY GROUP MEETS

Accidents — America's three and a half billion dollar parasite—will be put under the microscope in Chicago this month in the largest safety session ever held.

More than 10,000 men and women from all over the world will assemble in the Stevens Hotel October 10-14 as delegates to the National Safety Council's Silver Jubilee Safety Congress and Exposition.

Fred B. Hunt, Dewey Portland Cement Co., Davenport, Ia., general chairman of the Cement and Quarry Section will preside at the Section's sessions on October 12 and 13. Speakers on the program will include I. F. Le Gore, safety engineer of the Portland Cement Assn.; Hans G. Jacobsen, Bates Valve Bag Corp., who organized the safety work of the cement industry many years ago; C. L. Murray, Lehigh Portland Cement Co., Mason City, Ia.; and H. F. Yotter, General Crushed Stone Co., Easton, Pa.

Missouri to Sponsor Minerals Conference

A Missouri minerals-industry conference, sponsored by the Missouri School of Mines and Metallurgy and the Missouri Geological Survey, is to be held at the School of Mines on October 21 and 22.

The object of the conference, according to Dr. William R. Chedsey, director of the School of Mines, is for the mutual benefit of the producers of mineral products and the service institutions that are supported by the state. It will take the form of the presentation of problems of the various mineral industries by important-mineral producers.

Wisconsin Gravel Firm Installs Equipment

Conklin & Sons Co., Madison, Wis., have installed washing and grading equipment at sand-and-gravel pit in South Madison which they have been developing since early last spring. Production at the pit, which is under the supervision of Leo Stoppleworth, is more than 150 tons daily.

The company has also added several ready-mix delivery trucks to its fleet.

Small House Seen as Key to Recovery

The home costing between $4,000 and $6,000 is "king" of the current building recovery; small homes are selling readily in most cities, while houses at $8,000 and up are hard to dispose of, according to a survey of home building activities in 69 large and small cities by the Northwestern National Life Insurance Co.

Of the 69 cities covered in the survey, 27 reported increases in current residential building activity over last year, ranging from modest to vigorous in intensity. Fourteen cities reported activity approximately equal to that of last year, while 28 reported residential building below the pace of a year ago. The best comparative showings are being made in the southern and western section, while eastern cities generally are making poorer comparisons with last year's residential building activity.

Here's a New Use for Your Concrete Mixer

Down at Volcanoville, Cal., in the Mother Lode country, William and Elmer Ogle, brothers, became miners on the instant when they found a $1195 nugget. One of them made the find as he went from the house to the barn to attend the family cow. The family operates the hotel in that town.

The brothers obtained an old cement mixer to use as a mill and an old steam boiler in which to store water from a nearby spring.

The gravel put through the cement mixer has yielded three more nuggets that were worth $310, $456 and $783, and they have averaged a total of $4,000 to $5,000 for each period of two weeks that they have operated their outfit.

Anyway, that's the story as told by the Marysville (Cal.) *Appeal-Democrat*.

Detroit Firm Builds Addition to Plant

Increased demand for Macstone, a lightweight concrete unit faced with natural stone, has necessitated the construction of an addition to the plant of the Insulated Natural Stone Co. at Detroit, Mich.

New equipment is being supplied by the R & L Concrete Machinery Co., which holds the patent rights to the product and equipment for its manufacture.

Milwaukee Buys Silica Sand on Open Market

When the Milwaukee purchasing commission last month was unable through bids to secure the proper grade of silica sand for asphalt, Joseph Nicholson, purchasing agent, was instructed to seek sand on the open market. The city previously rejected three carloads which came from Ottawa, Ill., on a bid of $2.58 a ton on the ground that it did not comply with specifications.

Marquette Cement to Add to Barge Fleet

ORDERS SEMI-WELDED VESSELS

The Dravo Corp., Pittsburgh, Pa., has begun operations on an order for three semi-welded, hopper-type barges for the Marquette Cement Manufacturing Co., Chicago. According to T. R. Tarn, naval architect of Pittsburgh, who represents the purchaser in the plans and supervision of the work, the barges will be used for hauling bulk cargo, principally coal, over a 95-mi. stretch on the Illinois River to the cement company's La Salle plant.

The barges will have hull dimensions of 195 ft. by 35 ft. by 11 ft., and will be of conventional river design, hopper type, except for the distinction of a raised coaming at the main deck level. The framing will be riveted, but all deck, side, and bottom plating is to be welded with the exception of side and hopper plating in way of the side and hopper frames, where rivets will be used.

The cement company has long been a user of barges on the Illinois and Mississippi Rivers, and desired to take advantage of the economies of barge operation in getting its large coal requirements, estimated at 200,000 tons annually, for its La Salle plant.

General Crushed Stone Shifts LeRoy Workings

The General Crushed Stone Co., Easton, Pa., is moving the site of its Le Roy, N. Y., operations to a new location several miles away. A new quarry is being opened on the deposit which has been owned by the company for some time.

The work of moving the equipment has gone forward during slack periods in the past summer. J. Donald Hawthorne is superintendent.

Iowa Considers Adding Cent to Gasoline Tax

A proposal to levy another one cent tax on gasoline sold in Iowa is under consideration by the Iowa State Planning Board. The additional tax would be split three ways, one-third going to cities and towns for maintenance of streets, one-third going to counties for upkeep of secondary roads, and the remaining third to the state highway commission for matching federal funds.

Operations have begun at the new rock-wool plant of the Ohio Valley Rock Asphalt Co. at Summit, Ky. About 25 men are employed.

Analysis Shows How Road Building Helps

ECONOMIC INFLUENCE GREAT

The far-reaching influence of highway construction on employment and related industries is shown in *An Economic and Statistical Analysis of Highway Construction and Expenditures,* issued by the U. S. Bureau of Public Roads.

The analysis of the effects of a $100,000,000 highway expenditure is based on an assumed distribution to four classes of work as follows.

Grading	$ 19,387,900
Surfacing	63,247,300
Structures	16,019,100
Miscellaneous	1,345,700
Total	$100,000,000

This expenditure results in an annual employment of 102,690 persons of which 37,960 are employed directly on the job and 64,730 are employed indirectly in industries furnishing materials, equipment, and supplies.

The average annual construction expenditure in the United States from 1926 to 1933 was $8,894,875,000 of which $1,349,177,000 or 15 per cent. was spent for public highways. This expenditure resulted in the employment of approximately 1,385,000 persons directly and indirectly.

Distribution of funds from the $100,000,000 highway expenditure is made to four general items, each of which receive the following percentages:

Labor	24.39 per cent.
Equipment	21.29 "
Materials	48.75 "
Other Expense	5.57 "
Total	100.00 "

Equipment expense is distributed as follows:

Power Shovels, Cranes, etc.	$ 4,177,800
Graders and Scrapers	986,000
Drilling Equipment	743,500
Concrete Paving Equipment	1,587,200
Bituminous	760,400
Tractors	2,061,700
Trucks	8,563,900
Other Hauling Equipment	989,000
Culvert and Bridge Equipment	632,700
Pumping Equipment	485,300
Crushing, Screening, and Conveying	301,000
Total	$21,288,500

Materials expense is distributed as follows:

Fine Aggregate	$ 4,558,200
Coarse Aggregate	14,720,200
Cement	19,502,100
Iron and Steel	5,739,200
Asphalt, Tar	2,632,800
Lumber	648,100
Brick	104,000
Pipe	843,900
Total	$48,748,500

In summing up the economic influence of highway construction it has been found that the $100,000,000 expenditure eventually goes entirely to labor. The expenditure distributed through the many items required in highway construction sets in motion forces which eventually result in about $315,000,000 of business. This is the result of each successive stage of processing of materials which distribute expense to labor, equipment, materials, transportation, etc.

California Silica Firm Building New Plant

The Roberts Silica Co. of Pittsburg, Cal., has started construction of a $25,000 silica-sand washing plant near Pittsburg.

Most of the output of the new operation will be taken by the foundries of the Columbia Steel Co., it is reported.

Production Started at Washington Lime Plant

Production has started at the recently completed plant of the Union Lime Co. near Republic, Wash.

Austin Ward, well known on the Pacific Coast is superintendent and chemist and W. W. Gifford is director of operations.

National Gypsum Buys Oakfield Company

The National Gypsum Co. has acquired the Oakfield Gypsum Products Corp. at a price of 27,000 common shares of National Gypsum and $70,000 in cash, properties being located near Oakfield, N. Y. The company intends to use the machinery in the construction of its new gypsum plant at Savannah, Ga., according to reports.

Awards Contract for Dock at Oswego, N. Y.

The Merritt, Chapman & Scott Corp., Cleveland, O., has been awarded a contract for the construction of a bulkhead and dock at Oswego, N. Y., by the Huron Portland Cement Co.

Complete $50,000 Lime Improvement Program

Improvements approximating $50,000 have been completed at the Gibsonburg, O., plant of the Kelley Island Lime & Transport Co. and the string of remodeled kilns was fired for the first time in September. Thirty men have been employed on the project and approximately the same number will continue in the operation of the kilns.

Lyse, Noted Engineer, Returns to Norway

PROMINENT IN CONCRETE WORK

Inge Lyse, professor of engineering materials and in charge of the work at the Fritz Engineering Laboratory at Lehigh University, has resigned to accept the position of professor of reinforced concrete and solid bridges in Norway's Institute of Technology, Trondheim, Norway.

A graduate of the Norway Institute of Technology in 1923, Prof. Lyse came to the United States immediately thereafter and, during the following 15 years, has made an enviable reputation and a host of friends in the cement industry and engineering field. His first work was on hydro-electric projects in California. In 1927 he became assistant to F. R. McMillan, director of research, Portland Cement Assn. and at the beginning of the American Concrete Institute column investigation in 1929, represented the P.C.A. in direct charge of experiments at Lehigh University under the late Prof. W. A. Slater's direction. In 1931 he joined the faculty of Lehigh University as research assistant professor of engineering materials, became associate professor in 1933, and full professor in 1937. Since Prof. Slater's death in 1931 he has been in charge of all work at the Fritz Engineering Laboratory and conducted graduate instruction in the department of civil engineering.

Coming Events

October 10-14, 1938, Chicago, Ill. — National Safety Congress and Exposition, Stevens Hotel.

November 30-December 2, 1938, Washington, D. C.—Eighteenth annual meeting, Highway Research Board, National Academy of Sciences Bldg.

January 30, 31-February 1, nati, O. — Annual conventions, National Sand & Gravel Assn. and National Ready-Mixed Concrete Assn., Netherland Plaza Hotel.

January 30, 31-February 1, 1938, Cincinnati, O. — Annual convention, National Crushed Stone Assn., Netherland Plaza Hotel.

Prescribe Wage Rates for Cement Industry

RANGE FROM 40 TO 65 CENTS

The Public Contract Board has recommended that the Secretary of Labor prescribe prevailing minimum rates in the cement industry according to geographical location of plants. The suggested base rates range from 40 c. an hour in certain southern states to 65 c. an hour in the state of Washington.

Briefs registering objection or approval are being turned over to the Secretary of Labor along with the Board's recommendations.

Prevailing minimum hourly wages, as determined by the board, are as follows: Maine, 45 c.; Pennsylvania, New York, New Jersey, Maryland, West Virginia, Ohio, Delaware, Massachusetts, Connecticut, Rhode Island, Vermont and New Hampshire, 57 c.; Michigan, Indiana and Kentucky, 50 c.; Illinois, 63½ c.; Wisconsin, Minnesota, Iowa and Missouri, 55 c.; South Dakota, Nebraska, Kansas and North Dakota, 50 c.; Colorado, Wyoming, Utah, Montana, Idaho, Oregon, Nevada, Arizona and New Mexico, 55 c.; Washington, 65 c.; California, 62½ c.; Oklahoma, Texas and Arkansas, 43 c.; Louisiana, Alabama, Tennessee, Virginia, Georgia, Florida, Mississippi, North Carolina and South Carolina, 40 c.

Natural-cement manufacturers are not included in the Board's findings, but manufacture of puzzuolan and masonry cements when produced in Portland-cement are. At a public hearing before the Board last April the management committee suggested establishment of five regions and the representative of the organized cement workers suggested four regions for differentials on minimum wages.

Sees South Dakota as Leading Feldspar State

Modification of restrictions regarding mining in the game preserve of Harney Peak National Forest will permit mining in the largest feldspar and permatite deposit in the United States, M. W. Heumphreus, South Dakota mining inspector, announced in August. Approximately 46,000 acres adjoining Custer State Park in South Dakota will be opened.

The larger mining territory may force South Dakota into first place in feldspar production, Mr. Heumphreus said. The state ranked second to North Carolina last year.

Mining permits will be issued to civilians and must be obtained through the mine inspection office. No permits will be issued for claims within 660 feet of federal state or county roads, and all federal and state mining laws must be observed. While title to the mining claims will remain with the government, individuals may work them for an indefinite period. There will be no government charge for operation of the claims.

Material Service Opens Plant at Radom, Ill.

The Material Service Co., Chicago, Ill., has installed equipment to produce crushed stone for highway work at Radom, Ill. Hugh Tift, formerly located at Mt. Sterling, Ill., supervised the work of installing the equipment and he is in charge of the operations.

North Carolina Operator Making Concrete Bricks

The Grove Sand & Stone Co. of Asheville, N. C., has started the production of Dunbrik at a new plant recently erected and equipped.

Operations are in charge of Horace Jones.

$100,000 Mineral Wool Plant for Oklahoma

A $100,000 plant for the manufacture of mineral wool is to be built near Oklahoma City, Okla., in the near future, according to reports.

The firm of Bert D. Paine, Inc., was recently formed to promote and erect the plant.

Kentucky Concrete Firm Starts Production

Operations have started at the new concrete plant of the Transit Mix Concrete Co. at Owensboro, Ky.

The plant has a capacity of 400 cu. yd. of material per day. J. C. Gregory, Willard and G. W. Robinson are the owners and operators.

Concrete-Products Plant at Brunswick, Ga.

A new plant to produce concrete blocks and other products has been erected at Brunswick, Ga., by the McDonald Concrete Construction Co.

The plant fronts on the Coastal Highway. L. M. McDonald is president and general manager.

Birmingham Gets New Concrete-Pipe Plant

The Sherman Concrete Pipe Co. is spending $25,000 on a new plant for the production of plain and reinforced concrete pipe at Birmingham, Ala.

T. A. Fagaly of Montgomery, Ala., is at the head of the concern.

Builders to Confer at Washington, D. C.

ANNOUNCE AIMS OF GATHERING

A construction-industry conference, staged by the U. S. Chamber of Commerce in coöperation with the Construction League of the United States and national trade associations in this field will be held in Washington October 20-21.

The purposes of the Conference, as outlined by the program committee, are:

1. To emphasize the importance to the construction industry and to the public of private construction and its recovery if the industry is to prosper on a permanent basis.

2. To bring to the attention of the industry and of the public promotional plans which responsible groups in the industry are carrying on to stimulate private construction work.

3. To provide an opportunity for public discussion of the obstacles which need to be overcome to release the normal volume of private work.

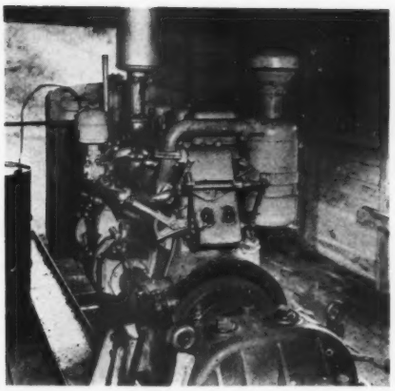
4. To emphasize again the essentially local character of construction and the need for coördination of local efforts to stimulate private construction.

Recent Equipment Installations ★ ★ ★

Two 12-ton Mack trailer trucks went into service early in August at the operations of the Minnesota Sand & Gravel Co., Minneapolis, Minn. The company plans to replace all its units with Macks in the near future. * * * *The Fort Scott (Kan.) Hydraulic Cement Co. has purchased two Freuhauf trailers and two International tractors for making cement deliveries.* * * * Robins Vibrex screens have recently been installed by the following concerns: Exner Sand & Gravel Corp., New York, N. Y.; New Haven Trap Rock Corp., Plainville, Conn.; and Midland Contracting Co., Bay City, Mich.

The George Mason gravel and sand plant at Edgerton, O., has installed a triple-deck Simplicity screen and an Allis-Chalmers gasoline engine. * * * *A new Butler batching bin is a recent addition at Jaeckle's Concrete Products, Inc., Okauchee, Wis.* * * * The Mt. Carmel Sand & Gravel Co., Mt. Carmel, Ill., is operating a new dredge on the Wabash River.

A fully-automatic Besser power stripper and a Besser mixer are included in the most recent equipment additions at the concrete-products plant of Superior Brick Corp., Minneapolis, Minn. * * * *The Columbia Quarry Co., St. Louis, Mo., has just installed its fourth National Superior Diesel engine. The new unit is a 420-hp. model.* * * * The Fuller Co., recently installed two 1,500-bbl. air-quenching clinker coolers at the Bath, Pa., plant of the Keystone Portland Cement Co.



LEFT—Looking down on the distributing conveyor and storage piles. ABOVE—The Diesel engine which drives the centrifugal pump.

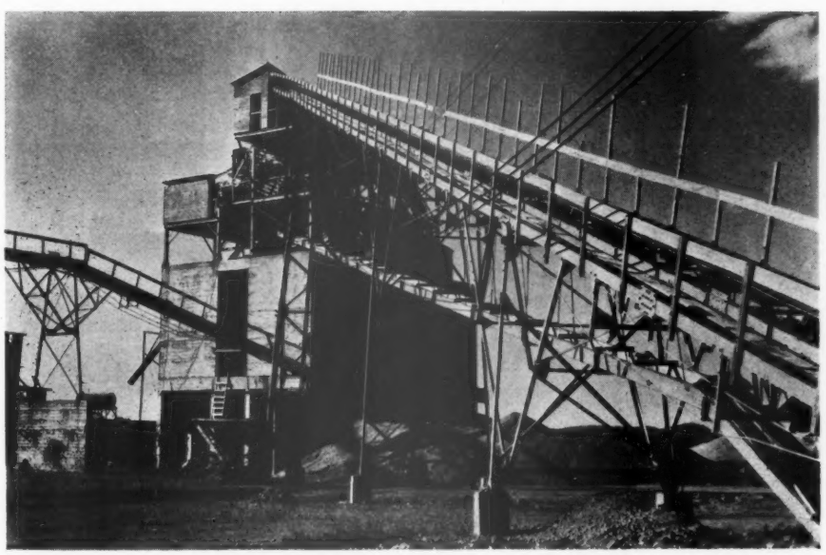
●

Gravel Plant Changes to Diesel Power

WHEN Brewer & Brewer Sons, Inc., built its modern sand and crushed-gravel plant at Chillicothe, O., in 1932, operations were started and carried on for some time using public-utility power. A complete story on this operation as originally built appeared in PIT AND QUARRY, issue of March, 1933. There have been few changes since, an important exception, however, being the change-over to Diesel power.

Now, three Caterpillar Diesel engines are on the job, furnishing power for the entire plant. One of these drives a 60-k.w. generator to supply electricity for lights and motors which drive the screens, conveyors, feeders, etc. Another Diesel drives two Greenville roll-crushers while the third furnishes power to operate an Ingersoll-Rand 10-in. centrifugal pump which supplies water for washing and other purposes.

Power costs are said to have been lowered tremendously with the use of the Diesel equipment.



LEFT—Conveyor leading to processing plant of Brewer & Brewer Sons, Inc. ABOVE—Diesel engine driving the two roll crushers.

EDITORIAL

"It Ain't Necessarily So"

PROBABLY no one knows to what extent or how often the actions of himself and of those near to him are influenced and even determined by spoken or printed words or by deeds. Since the World War the force which has been utilized to effect changes in the emotional attitudes and reactions of large groups of people has acquired a malodorous reputation. Having been seen most often in its uglier forms, as when it has been used to spread fallacious ideas or to distort the truth, it has been given the taint of immorality and is now more often condemned than condoned. Yet propaganda may be motivated by high moral and social purposes; those who utilize it may be utterly free from base designs; its methods may be above reproach.

Propaganda is a form of special pleading, not different in any important sense from the methods of the lawyer at the bar, the speaker at a political rally, the salesman at the prospect's door. It has special, definite objectives, which must be attained by any means that are available and effective. If these objectives can be attained by truthful means, the propagandist is fortunate; if they can not, his efforts must carry the cloak of truth, they must bear the mark of pseudo-genuineness, however that may be accomplished.

Most forms of propaganda and the majority of the examples of propaganda which the average man encounters are necessarily concerned with the spread of ideas rather than with the diffusion of truth. Openness, truthfulness, candor in its simplest forms are convenient and useful auxiliary tools, if they can be used, but deceit, dissimulation and falsehood serve as useful and effective substitutes in the hands of an expert propagandist. This fact alone exposes all obvious propaganda to mistrust and often to unusually close examination, particularly by propagandists on the opposing side, but it does not seem to lessen its effectiveness in the attainment of its objectives. Since all propaganda is designed to win conviction for the principles it propagates, it naturally avails itself of all the means that are available for the attainment of its ends. It is a tool in the hands of its master, and its usefulness is measured in terms of its serviceability to its master and not in terms of social or moral values. The lawyer is employed to win his client's case, the speaker to win his candidate's election, the salesman to sell his employer's wares. No realist would assert that any one of these special pleaders should be condemned for his indifference to or misuse of the truth.

For its ultimate success propaganda depends on its ability to present in the most favorable light the ideas which a group seeks to promote and to ignore or disparage the ideas of its opponents. Often the greatest amount of effort will be devoted to attempts to conceal the real objective of the propaganda; at other times this will be lavished on attempts to discredit, belittle or embarrass the opposition. Although these efforts will often lead those who put them forth to areas and paths that border upon or run into the truth, these danger zones will be avoided as carefully and as long as possible lest the framework of favorable attitudes and reactions be weakened or destroyed by dangerous facts.

While people have become more astute and more mistrustful of what they hear and read, propagandists have become more expert in the practice of their art. The very skepticism that has been born of the excessive or clumsy use of propaganda has been utilized by the most alert propagandists as a new point of entrance to the ever-open-to-prejudice mind of the average person. Affecting a confidential tone or language, seeming to "lay all the cards on the table", disclaiming all intention to deceive, avowing an utter lack of financial or other selfish interest in the outcome of his hearer's or reader's decision, the artful propagandist lays a firm foundation on which ultimately to erect, with the unconscious aid of the hearer's or reader's gullible mind, a structure of usable conviction.

STRANGE as it may seem, even men of scientific minds are not safe from the emotional and intellectual sallies of the propagandists. Doctors of medicine are constantly subjected to pseudo-scientific propaganda from the manufacturers of pharmaceutical preparations. Samples of new products, accompanied by literature phrased in the high-sounding jargon of the industry, are mailed to all members of the profession, and these, accepting the proferred statements at their face value and having no individual means of verifying or correcting them, confidently experiment with these products on selected "guinea pigs" among their patients.

Engineers, both privately and publicly employed, are sometimes led to recommend the purchase of untried and even basically-unsound appliances through technically-phrased overstatements or misstatements of their qualities and efficiencies. Even the caution and doubts of technically-trained men can be overcome by propaganda that has been properly designed, if their prejudices, unavoidable lack of information, and natural optimism are properly dealt with.

EDITORS of newspapers and magazines, however great their desire to serve their readers well, are not invulnerable to the well-planned attacks of the propagandist. Every day thousands of pieces of propa-

ganda material, designed to influence the judgment, to fan the prejudices, to allay the doubts, to appease the consciences of well-meaning publishers and writers emanate from the offices of various propaganda agencies. Labor organizations, associations of business men, consumer groups, coöperative bodies, political parties, government departments, other publishers, academic groups, banking institutions, statistical organizations, "confidential reports" writers, investment houses, inventors, patent attorneys, anti-labor associations, "industrial counsellors", Washington "behind-the-scenes" letter-writers, free-lance "personal-relations" experts, and scores of other types of propaganda sources pour an almost endless stream of special-interest pleading across the editorial desks of this country. Scarcely a day passes without at least one example to remind us of the need for incessant watchfulness against the cleverly-worded and artfully-conceived products of these "molders of public opinion". And most editors have neither the time nor the facilities for testing the truthfulness of all the freely-offered publicity that reaches them. Consequently much of it, perhaps most of it, is given the dignifying and imposing dress of type presentation and is disseminated among the information-hungry but factually-undernourished populace to add to the already staggering amount of misinformation that afflicts people who try to appraise fairly and judge wisely.

Propaganda is not necessarily either bad or good in its effects. Of some propaganda the real effects can not be foreseen, because it is seldom possible to appraise correctly the value of its objectives or the importance, nature or extent of its influence. In some cases the ultimate effects may never become known. The propaganda for and against the prohibition of intoxicating liquors, state ownership of public utilities, government regulation of industry, public employment of the privately-unemployed, and dozens of similar social problems may have both good and bad effects at the same time, and the decisions that may be made in public policy as the result of it may have effects that are entirely outside the range-of-view of people of our day. Labor-organization propaganda in favor of higher wages and shorter hours may lay upon some employers temporary burdens too heavy for them to bear, yet it may focus attention on a problem—the proper relation between wages, hours, prices and profits—that must be solved in the interest of industrial peace. Propaganda for the stricter regulation of business may result in the imposition of temporary hardships but it may tend to lift the standards of business conduct to higher ethical levels. Propaganda for the public employment of the privately-unemployed may lead to minor inequities and abuses, but it certainly will increase the public's interest in a problem that has too often been looked upon as one of purely private concern. Propaganda urging a wider use of milk as a beverage may, despite its harmful effects on the coffee industry, render a social service by raising the general health level. Propaganda in favor of peace, however desirable that end may be, may lead to ignoring some of the most effective ways of preserving it.

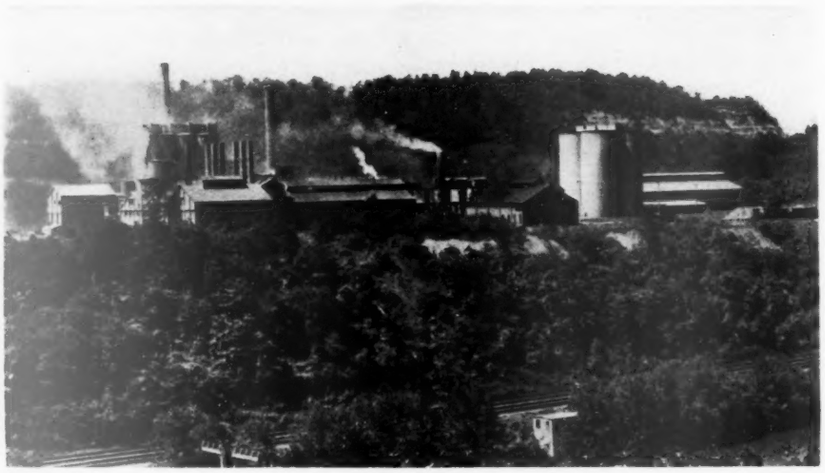
Propaganda may be serviceable or disserviceable, but whatever its nature, it is an old and well-established method of influencing human action. From Plato's *Republic* to Hitler's *Mein Kampf* propaganda has been approved and used by leaders of thought and action in all ages. The discovery of the art of writing greatly widened the opportunities for propaganda, even if it did no more than enable Hammurabi to inscribe records of his prowess on the temple stones of Babylonia or the Samnites to fill the walls of Pompeii with election appeals. The invention of printing gave still more scope to the ambitious propagandists of later years.

SINCE those days propaganda has served many masters and many causes. Through its powerful voice and facile pen the aims, desires and hopes of farmers, trade unionists, educators, manufacturers' associations, railways, public utilities, and professions have found expression. The American Medical Association, the United States Chamber of Commerce, the National Electric Light Association, the American Farm Bureau Federation, the Cotton Textile Institute, the American Federation of Labor, the American Red Cross, the Friends of the Soviet Union, the Anti-Saloon League, the Society for the Prevention of Cruelty to Animals illustrate the variety of interests that can be and have been served by the instrument of propaganda. The boy who brags of his father's strength in order to gain admittance to the neighborhood "gang" is as much a propagandist as the housewife who boasts of her social contacts to extend her credit with the corner grocer, or as the government which, to arrest the falling morale of its people, invents mythical enemies both within and without its borders and then knocks them down with loud acclamation of its political and diplomatic "victories".

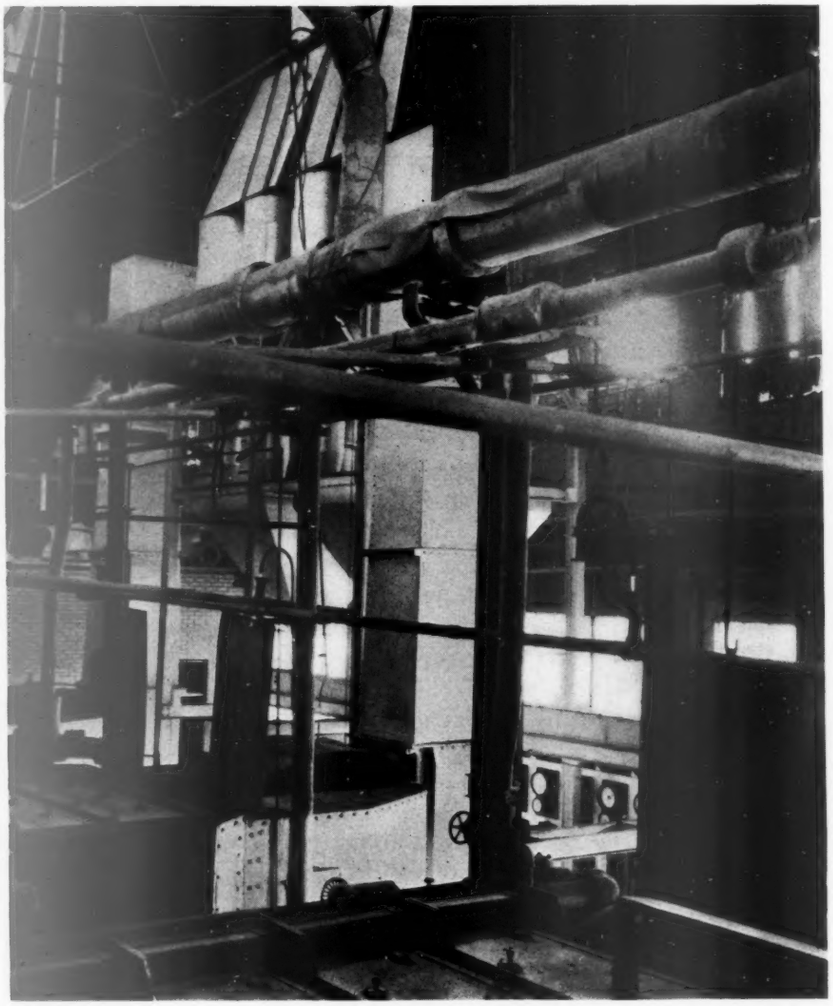
In our rapidly-changing social order the opportunities for the propagandist are practically unlimited and the temptations to indulge his craving for influence and to serve the interests that employ him readily transfer propaganda from the realm of facts to the land of make-believe. The daily newspaper—its news, its editorials, its advertisements—is filled with serviceable and disserviceable propaganda; magazines, billboards, directing traffic signs, practically all forms of written and spoken language have either the flavor, the form or the substance of propaganda of a sort. But in the words of the cynic in *Porgy and Bess* "It ain't necessarily so". And even these words of ours, in so far as they urge the adoption of a more critical attitude toward what one hears and reads, constitute a form of propaganda, which may contribute a mite toward the "canceling-out" of the kind designed to mislead.

By W. E. TRAUFFER

INSTALLS NEW TYPE OF DUST-COLLECTING



The Wampum plant from hillside east of it.

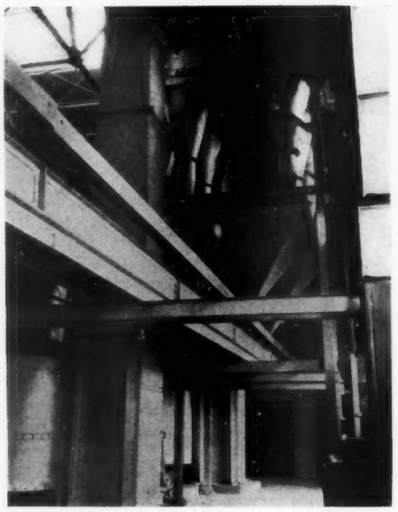


Two of the dust collectors showing fan housings and ducts.

THE plant of the Medusa Portland Cement Co. at Crescentdale, near Wampum, Pa., enjoys the distinction of being one of the pioneer operations in the cement industry west of the Lehigh Valley. To the observer, however, this plant is distinguished by its up-to-date methods and the modern equipment used. Always among the first to adopt means of improving its operations, the management of this company recently installed in this plant a Buell dust-collecting system for the removal of kiln dust which was formerly discharged through the stacks. This system is of a type new to the cement industry of this country, although numerous installations have been operating successfully for years in European cement plants.

The original plant at Wampum was built in 1874 by the Wampum Cement & Lime Co., Ltd. This was taken over by the Crescent Portland Cement Co., which in 1909 built the present plant near the old one, of which only the foundations now remain. In 1929 the Medusa Portland Cement Co. purchased the Crescent property and retained the "Crescent" trademark.

Many improvements were made to this plant both during and before its present ownership. In 1920 and 1922 waste-heat boilers and new raw- and



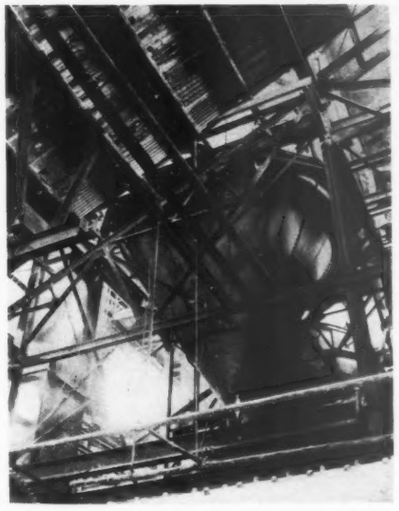
Duct from one of the boilers with screw-conveyor below the collectors.

finish-grinding mills were installed; in 1925 a Fuller-Kinyon raw-material-blending system was put in and cement-storage silos were built. A new steam power-plant was added in 1926. In 1935 Vanderwerp recuperators were

installed on two kilns. Two more recuperators, two separators and a cooler were installed in 1936, at which time the raw-grinding department was rebuilt. In 1937 another separator was added, new mill feeders and equipment for the production of mortar cement were installed, and a modern new washroom for the employees was built. The 1938 program so far has included the installation of secondary superheaters on the waste-heat boilers, new blending-bin and kiln feeds and the flue-dust collecting system.

The rock used in this plant is obtained from a mine, which has been developed into one of the most extensive operations of its kind. Stone is loaded by 5 Osgood air shovels into cars, which are "spotted" by mules and hauled to the mine opening by Porter coke-burning steam locomotives. The mine roof is 18 ft. high and the rooms are 30 ft. square, affording ample ventilation. In May, 1938, a worked-out section of the mine was leased out for the growing of mushrooms. The combination of humidity, coolness and darkness seems to be ideal for this type of horticulture, which is becoming quite a popular by-product for limestone mine operators.

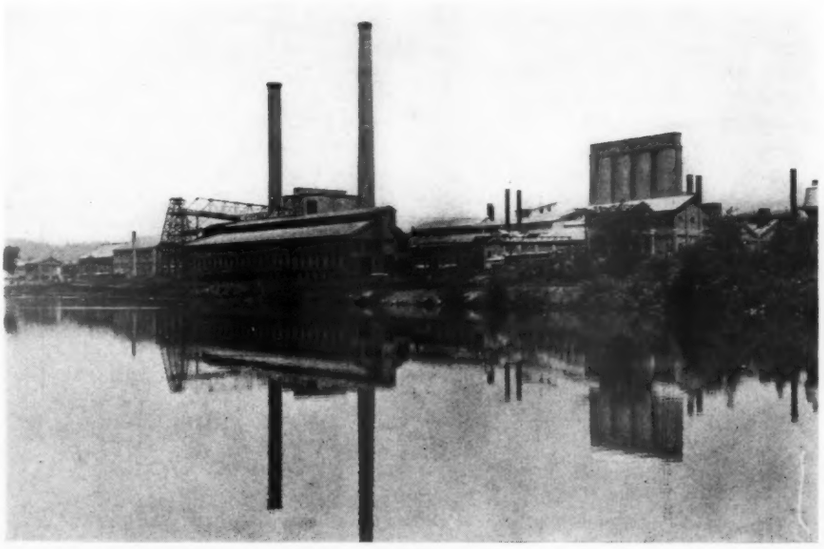
Sand required in the mixture is received by motor trucks from a deposit



The 18-ft. separator which operates in closed circuit with the two finish-grinding tube-mills.

2 mi. from the plant. Stone is brought to the plant by a Leschen continuous tramway, which is ¾ mi. long and has a capacity of 125 tons per hr. The crushing is done in an Allis-Chalmers No. 8 McCully machine followed by a

Close view showing two sets of four cells each, collecting dust from two of the four kilns.

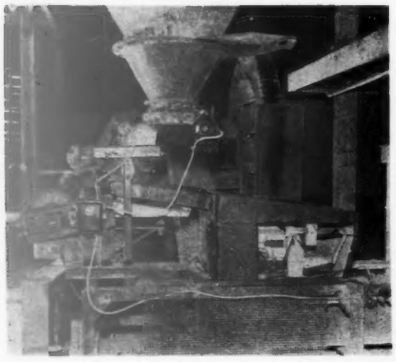


A view of the plant from across the water-supply pond. Cableway from quarry in left background.

Pennsylvania hammer-mill. A conveyor with a Link-Belt traveling tripper discharges the stone into three bins. Sand is stored in a fourth bin. In withdrawing the stone from these bins with belt-feeders, a rough blending is obtained on a belt-conveyor. A Merrick Weightometer weighs the material on the conveyor and for every 1,000 lb. of it a predetermined amount of sand is automatically discharged from the sand bin on the conveyor.

This raw mixture is discharged into two 7-ft. by 60-ft. rotary driers, from which the dried material goes to a bucket-elevator followed by a belt-conveyor. A small dust-collector has been installed at this point. This conveyor replaced an inclosed drag-chain conveyor formerly used. Steam is released from the dried material in passage, giving it an additional cooling. The raw material then passes to a bin feeding the No. 1 Hercules mill. The product of this mill goes to an elevator followed by screw-conveyors feeding a bin for the No. 3 and 4 Traylor 7-ft. by 26-ft. raw-grinding tube-mills.

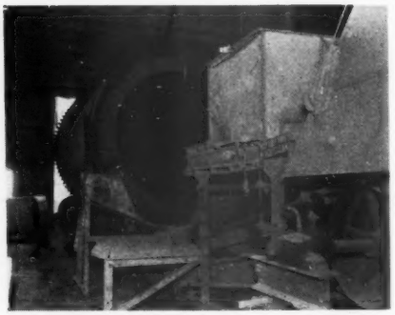
Originally there were four bins, two for the two raw-grinding mills and two for the two finish-grinding mills. These mills were originally 2-compartment machines used for raw grinding only, but when separators were installed in



One of the three proportioning feeders used in the masonry-cement department.

closed-circuit with them they were converted into tube-mills and two of them were transferred to clinker grinding. When the original system of direct-feeding to the raw mills was replaced, the bottom of one of the bins was cut off to give more headroom. Two screw-conveyors now withdraw material from this bin into two smaller bins. Slightly more material is fed to the two raw-mill feed bins than the mills can handle and any excess is carried over the bins and returned to the elevator feeding the large bin. In this way the feed bins are always kept full. This system was designed to prevent the material from arching in the large bin and flooding the mills. Now any material flooding out of this bin joins the overflow of the small bins and is recirculated. Dog-leg screw-feeders set at an inclination of 25 deg. feed the two raw mills, each of which is grinding 100 bbl. per hr. to 90 per cent. through 200-mesh.

The product of each raw tube-mill is elevated to its individual Sturtevant 16-ft. separator. The "rejects" are returned to the mill at the trunnion feeder following the dog-leg feeder. The fine product of each separator is discharged into an individual 10-in. Fuller-Kinyon pump feeding the four 21-ft. by 90-ft. reinforced-concrete blending bins of the Fuller-Kinyon raw-material-blending system. At present the material is reclaimed from these silos by a single

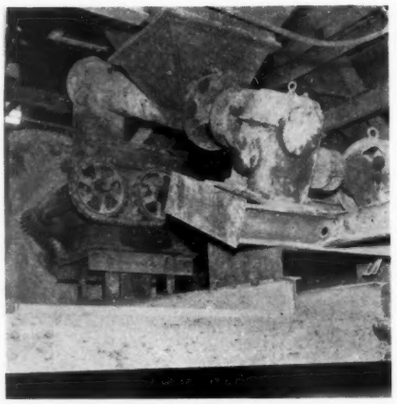


The rotary cooler with automatic scales in foreground.

screw-conveyor feeding a cross screw-conveyor followed in series by an elevator and a screw which serves the four kiln-feed bins. A second collecting screw-conveyor under the blending silos, to be installed later, will make it possible to feed half of the material withdrawn to the two pumps for recirculation through the system and even better blending than is now obtained.

A circulatory kiln-feed system is also used. Any excess material is carried over the bins by the screw-conveyor and is returned in another screw to the elevator in closed-circuit. One of the four kilns now in use is 10 ft. and 8 ft. in diameter and 132 ft. in length, and the other three kilns are 8 ft. by 125 ft. in size. One of the 125-ft. kilns has been equipped with a Manitowoc Minogue circumferential feeder, which introduces the material into the kiln under the bed of material already in it. This method of feeding has reduced the dust loss considerably, a result that is especially important in this plant because waste-heat boilers are used. There are also two 8-ft. by 125-ft. kilns which are not now connected, but which can be reconditioned if they are ever needed.

Each of the four kilns is equipped with a Manitowoc Vanderwerp recuperator. The first two recuperators were installed on two of the 125-ft. kilns. Newer Type CI short-plate type recuperators are on the other 125-ft. kiln and the 132-ft. kiln. According to A. F.



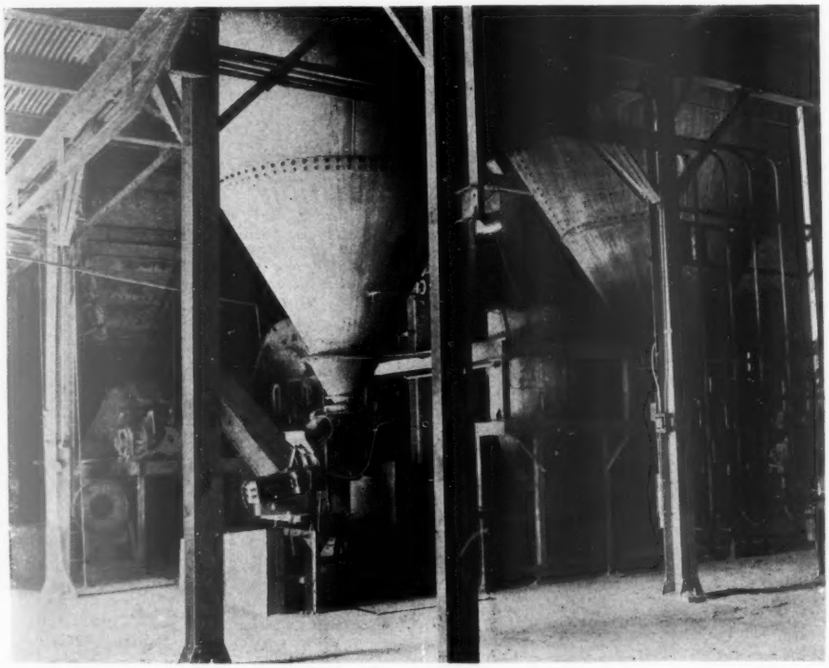
The dog-leg type of feeder on one of the finish-grinding tube-mills.

Krebs, superintendent, these recuperators have reduced the coal consumption from 120 lb. to an average of about 85 lb. per bbl. when making standard Portland-cement clinker. The recuperators are also credited by Mr. Krebs with improving the grindability of the clinker to such an extent that, with the aid of improvements made in the finish-grinding department, the capacity of that department has been increased 50 per cent.

This year most of the cement produced has been of a special type which has required about 95 lb. of coal per bbl. This increase in fuel consumption was partly due to the necessity for more heat for the waste-heat boilers because of the greater power demand when grinding this cement.

The clinker was formerly discharged from the kiln at temperatures over 2,000 deg. F.; now the clinker-discharge temperature averages about 900 deg. F.

The installation of the Minogue

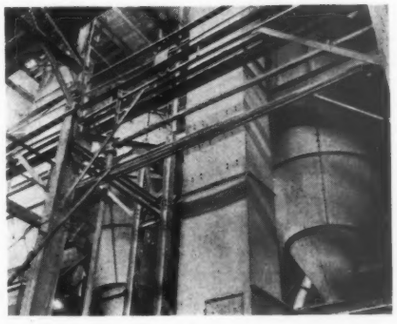


The masonry-cement department with some of the bins, vibrating feeders and tube-mills.

feeder on one of the kilns also increased its capacity somewhat.

The exhaust gases are drawn from the kilns at a temperature of about 1,450 deg. F. into four 750-hp. Edgmoor waste-heat boilers equipped with primary and secondary Foster-Wheeler superheaters and Greene fuel economizers. A fifth 1,000-hp. waste-heat boiler, formerly used for the two inactive kilns, is now used as an auxiliary. It is fired by a Herborn Engineering Co. "Blomatic" stoker. Fans draw from the economizers into the four new Buell dust-collectors, which, in order to obtain compactness, have been grouped into dual units each serving two kilns. Each collector consists essentially of four Type 10½ A cells or cyclones, four for each kiln. The flue from each fan rises vertically to a horizontal chamber which turns at a right angle toward the collector. This chamber is separated into four sections of equal width by three vertical steel dividing plates. Each section then diverges to one of the four cells serving that kiln. The air from these four collectors is vented to the atmosphere through four old kiln stacks.

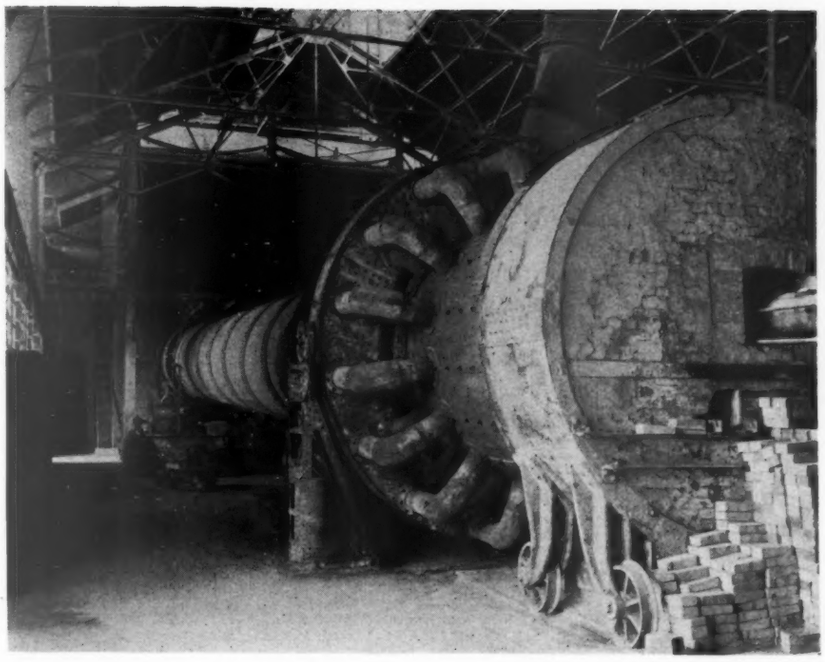
The collected dust from each set of four cells is discharged into a hopper. The dust in these four hoppers drops into a screw-conveyor, which is followed by a bucket-elevator that discharges the dust into a concrete silo in line with the four raw-material-blending silos. Dust can be fed from this



The two 16-ft. separators in closed circuit with the two raw-grinding tube-mills.

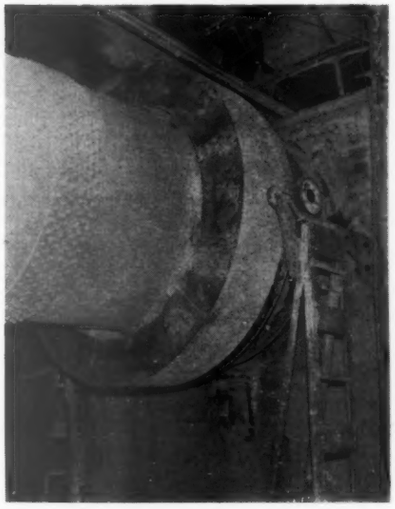
bin direct to the raw-material flow preceding the blending bins or it can be discharged into trucks. Much of this dust has been sold to farmers.

Clinker is discharged from the kilns to three Link-Belt Peck carriers, which feed an 8-ft. by 84½-ft. rotary cooler. This cooler was shipped from the company's plant at Bay Bridge, O. It has been divided into quadrants by steel plates, each one of which is divided on each side by an angle iron. Clinker is discharged from the cooker at a temperature of 115 deg. F. on a belt-conveyor and is weighed by a Merrick-Weihtometer as it passes to a bucket-



Short-plate recuperator on one of the four kilns. This photo was taken before operations were resumed.

elevator feeding the No. 3 Bradley Hercules mill-feed bin. The No. 2 Hercules mill is used as an auxiliary and can be used for preliminary raw or finish grinding if necessary. Screw-conveyors and elevators carry the Hercules mill product to the bin feeding the No. 1 and 2 Traylor 7-ft. by 26-ft. finish-grinding tube-mills. A circulatory feed system identical with the one in the raw department is used. The product of the tube-mills is elevated to an 18-ft. Raymond separator equipped with a double Whizzer. The separator "rejects" are returned to the mills. One of these mills is now producing 110 bbl. and the other 125 bbl. per hr. grinding to 1,750 specific surface area.



The circumferential feeder which is being used successfully on one of the kilns.

It is interesting to note that the 3 Hercules mills were formerly used for preliminary clinker grinding and 8 tube-mills were used for finishing. This work is now being done with one Hercules mill and the two converted tube-mills in closed-circuit with the separator. Two of the 8 tube-mills are used occasionally in the production of masonry cement and other special products. A Jeffrey Waytrol feeder is used under each of three bins, one of which is used for cement, one for lime and one for stone. They discharge to a common screw-conveyor.

The finished Portland cement is discharged from the Raymond separator to an 8-in. Fuller-Kinyon pump which puts it in storage. Four storage silos with their inclosed star bin hold 116,000 bbl. and the old stock-house has a capacity of 94,000 bbl. One pack-house serves both storages. The four 4-spout baggers have individual belt-conveyors which carry the sacked cement into cars.

Erratum

In an article describing the use of quarry waste by the New Castle Lime & Stone Co. on page 63 of the September issue, it was stated in error that each of the four Bradley mills grinds an average of 35 to 38 tons per hr. The article should have said that all four mills combined produce this average. As each of these mills has a nominal capacity of from 8 to 10 tons per hr., the original statement gave an entirely wrong impression concerning the results obtained.

By WILLIAM C. RIETH

MODERN KILN PRACTICE IN THE CEMENT INDUSTRY

FOR the efficient and economical production of a high-grade, well-burned and sound cement clinker the rotary kiln still retains its place.

From calculation we know that the dry-process kiln is lower in fuel consumption; at the same time figures also show that the efficiency of such a kiln is low, a subject which will be discussed in another article at a later date. The wet process, therefore, will be given first consideration. It is to be recommended for five reasons:

1. In the preparation, mixing and control of the raw material with the addition of water up to 40 per cent. it assures a more finely-ground product.
2. Uniformity in kiln feed and clinker product.
3. Simplicity in its operation, elimination of rock and shale driers and handling equipment.
4. Power and labor economy.
5. Cleanliness and the reduction of dust losses, which effects a saving in additional handling equipment that would otherwise be required for the mixing and proper utilization of the dust due to its alkali accumulation or to irregularity which interferes with the chemical constituents of kiln feed.

Kiln Design.—Great efforts have been made to offset the cost of the additional fuel necessary for the dehydration of the raw material, and this result has been accomplished with the introduction of the large rotary kiln with inner armatures. This kiln comes in various diameters from 10 to 15 ft. and in lengths up to 600 ft., according to its output.

Some of these kilns are of the straight uniform-diameter type throughout their length; others are kilns with enlarged diameters either in the calcining zone or in the calcining and dehydrating zones. In the latter case the enlarged-diameter zones are easier to equip with heating elements of maximum surface area, for the transmission of heat for drying and partial calcination of the raw material within a shorter distance of kiln length, thus keeping down the length of a kiln.

For the efficient evaporation of the water and partial decarbonization of the raw materials the modern kiln is equipped with flow restrictions, such as chains, lifter devices or other metallic bodies of large exposed surface areas. built within 10 ft. from the feed end and up to 75 ft. in length into a kiln, depending, of course, on the length of such a unit. The purpose of these restrictions is to provide the maximum evaporation surfaces, to facilitate the transfer of heat from the hot gases to the material to be burned at lower temperatures, reducing radiation losses to the minimum and achieving low fuel consumption for the clinkering of the slurry. The object of the operator is to conserve and utilize every possible B.t.u. furnished by the fuel and to have the exhaust gases leave the kiln at their lowest temperature.

For the clinkering of cement slurry the following heat transmission takes place:

1. Evaporation of mechanical and combined waters.
2. Expulsion of carbon dioxide.
3. Combustion of any organic matters or carbonaceous materials.
4. Oxidation of the iron compounds.
5. Oxidation of the iron sulphates and pyrites from rock.
6. Partial combination of oxidized sulphur with the calcium oxides.
7. The mechanical reaction by diffusion through the flux and final formation of the clinker.

Kiln-Size Determination.—In the determination of the length of a kiln some manufacturers go somewhat to extremes in their recommendations, but it depends more upon the cubical contents of the kiln's burning or calcining zone rather than the length of the kiln itself. For instance, for a 2,000-bbl. daily capacity a 300-ft. rotary kiln, with a properly-balanced enlarged-diameter burning or calcining zone and a balanced-length dehydration zone, equipped with sufficient heating elements exposing large surface areas, can be designed to be as efficient as a 400-ft. straight kiln, operating on a 95 per cent. operating hour efficiency and at less cost.

The writer prefers to put the additional cost of the extra 100 ft. of length into a good sized rear housing for the initial collection of dust, thus increasing the overall efficiency of operation of such a kiln unit and making it possible to utilize the full percentage of accumulated dust from electric precipitators for the efficient operation of these units.

A kiln which, in order to give more than 2,000 bbl. output, may be made as large as 600 ft., may, in case of irregular market conditions, become a liability rather than a real effective unit in comparison to the amount of grinding equipment necessary for such a large installation. In my opinion, it defeats the principle of economical manufacture of the product by increased power, labor and maintenance cost, in addition to the large investment and overhead charges which must be carried while such a unit is idle. A continuous ten-months operation in the year with two balanced kilns of equivalent output should be recommended in preference to one unit operating half of the time, where occasions may arise for shut-downs due to unavoidable circumstances which affect the brick lining and the kiln's physical structure, increasing maintenance and repair cost, fuel expenditures, disorganizing labor conditions, and increasing overhead charges generally. A two-kiln system also provides greater flexibility so that various grades of clinker can be produced for the special cements called for by large government projects as well as soft-burned and lower-grade cements meeting standard specifications, and these can be produced at lower cost, meeting keen competition.

Fuel Cost.—In sections where the fuel cost is low it is a matter of the time wherein large kiln units are supposed to write themselves off. Where the fuel cost is high, due to long freight hauls, unsound labor conditions, preparation and storage costs, it is advisable to investigate other types of kilns, which are sold strictly on guarantees covering operating efficiencies and fuel savings and which meet local conditions that forbid the installations of unusually long kilns.

The Lepol Kiln.—The Lepol type of kiln was introduced to the market as a so-called combination unit, consisting of an individual drying and calcining furnace in connection with a short rotary kiln. A kiln of this type has been successfully used during the last three years by the Spokane Portland Cement Co. at Irvin, Wash. [See PIT AND QUARRY, January, 1936, pp. 80-88, 90.]

In this particular case local conditions, space and high fuel cost would not allow the installation of a long rotary kiln. Also, the problem was one of reconstruction involving the replacement

of an old 8-ft. diameter by 160-ft. dry-process kiln which had a capacity of 800 bbl. per day, now 1,200 bbl. The Lepol kiln had to meet all the requirements in order to warrant its investment, which involved approximately 40 per cent. more money than the installation cost of a modern rotary-kiln plant with all the appliances for reduced fuel consumption. The guarantee called for a kiln to burn 15 per cent. less fuel than the most efficient rotary kiln now in operation, and to give a 50 per cent. increase in output over that of the original installation, based on 680,000 B.t.u. fuel consumption in comparison with that of the improved rotary kiln, 900,000 B.t.u. on dry coal. The writer prefers to call the Lepol system a semi-wet process unit, in which the dry material, depending on its consistency, is saturated with a uniform spray of water usually 12 to 14 per cent., to make it possible to nodulize the raw material in a rotary drum. The drum is properly speeded to enable the material to be formed into true spherical balls of uniform diameter. From the drum these are fed to, and evenly distributed in thickness of 6 in., on a stoker-type grate conveyor of a large table area. This slow-moving traveling grate, 7½ ft. wide and 38 ft. long, is built of heat-resistant material and is erected within a steel-incased, insulated and firebrick-lined boiler-housing, in which the hot gases from an 8-ft. diameter by 100-ft. rotary kiln at approximately 1,800 deg. F. are forced through the bed of balls or pebbles. The latter thus exposed a large surface area for the effective absorption of moisture and the partial calcination of the kiln feed before it enters the kiln. The exhaust stack temperatures average from 250 to 275 deg. F.

The procedure for the final clinkering is the same as in any other rotary kiln, except that, on account of its nodulized-pebble structure of the material in the decomposition zone, it holds the radiant heat in the critical zone where it is most needed, resulting in a higher flame temperature and a strongly-oxidized atmosphere in the fluxing compartment. Under these conditions the clinker is heat saturated sufficiently to produce a highly-burned, crystalline and sparkling clinker consisting of infinitesinal particles of a very high grindability for the production of a high-surface area cement.

On account of the intricate design of such a furnace and the highly-developed mechanical features subjected to extreme temperatures and physical hardship the cost is bound to be higher than that of any other unit. Considering, however, the fact that the actual fuel saving amounts to 220,000 B.t.u., equivalent to 17 lb. of coal per bbl. of clinker burned, one can hardly question the justification of its additional expenditure if the investment should write itself off within 10 years.

There are, of course, arguments against such an installation, involving power, maintenance, and the additional labor cost necessitated by the requirement of skilled burners especially trained for the successful functioning of such a furnace.

These facts are important to a management, and while it may be true that they affect only a small percentage of the fuel saving, they become practically nil since they are offset by lower grinding costs owing to the superior-quality clinker, a reduction of dust losses, less expensive dust-abatement equipment, and reduction in maintenance cost due to the simplification of the dust-handling facilities.

When new problems are involved, such as the utilization of the waste stack gases of a kiln for steam generation, a Lepol kiln can not be of any merit. Any standard-type rotary-kiln plant producing high stack temperatures will meet the demands for the successful operation of waste-heat boilers with either the dry or the wet system.

Slurry Driers, Filters and Calcinators.—There are many other kinds of equipment to decrease fuel consumption and increase kiln output worthy of investigation before coming to a decision on the installation of a new kiln unit.

The slurry filter is an efficient dewatering system and serves its purpose well, reducing the moisture content of a slurry from 40 to between 18 and 12 per cent., depending on its fineness and the plasticity of its argillaceous ingredients. Thus, it curtails fuel consumption in direct ratio to the percentage of water expelled.

These filters are particularly suitable in plants equipped with waste-heat boilers for steam-generating purposes. The Southwestern Portland Cement Co. at Osborn, O., has installed these filters with remarkable success. It has reduced its fuel consumption nearly 15 per cent. and increased its output approximately 10 per cent., with an increase in boiler efficiency and a decrease in power cost by the curtailment of stand-by power.

The calcinator and the slurry drier are of entirely different construction. They consist of steel-incased, insulated and bricklined inclosures, housing the vertical cylindrical double drums or a horizontal rotary-type container, which hold chains or hollow cylindrical heating elements that offer large exposed surface areas and through which the exhaust gases of the kiln are forced to heat these media. The latter in turn transfer the heat to the surrounding slurry, instantly driving off the moisture, and producing a partial calcination of the raw material.

The flow and temperatures of the gases are controlled by means of an electrically-operated damper and stack-draft control apparatus to maintain a uniform exhaust temperature averaging from 300 to 450 deg. F. escaping to the atmosphere. These machines are reliable and are easy to install over the feed end of a kiln in direct connection with the rear housing and stack. With the exception of the exhauster a machine of these types does not take much power, averaging from 30 to 50 hp., according to the volume of gases handled.

The calcinator is adaptable to both the dry and wet systems and its functions are similar to those of a Lepol furnace. It is low in maintenance and operating cost, giving a fuel saving as high as 23 per cent. and an increased kiln output up to 18 per cent. The additional power consumption is compensated for by the reduction in dust losses, and the simplicity of its operation.

Chain systems and inner armatures of large surface area, built into a drying zone of an existing modern kiln, show greatly enhanced kiln efficiencies with calculated fuel savings guaranteed to merit their investment. They are not as flexible as a drier or a calcinator.

Spray System.—The spray system, such as that covered by the Rigby patents in England, by which the slurry under a high pressure is fed into the feed end of a rotary kiln and the on-rushing exhaust gases, has not met with much success in this country and has practically been abandoned. European engineers, however, have not stopped to improve upon the system, and in 1935 the writer installed one of the systems with great success at the Victorville, Cal., plant of the Southwestern Portland Cement Co.

In brief, the slurry under high pressure is forced through a series of patented spray nozzles, within 6 ft. of the end inside the kiln into the passage of the exhausting kiln gases in such an infinitesimal fine spray covering the entire exposed cross-sectional kiln area that, when in contact with the hot gases, readily releases its moisture.

It accomplishes a fuel saving of 15 per cent., with an increased kiln output of 12 per cent., which for the small investment involved with such a system certainly justifies a trial.

Two Eastern plants and several plants in the Northwest have equipped some of their kilns with the system.

Clinkering and Clinker Coolers.—In the clinkering of the raw materials heat is evolved and for that reason every bit of sensible heat of the clinker as it leaves the kiln should be utilized by means of either cooler-zone extensions

or other apparatus. This exothermic heat should be used to advance the flame temperature for complete combustion of the fuel, radiating heat of the material and thus increasing the heat intensity for the fluxing and final firmation of clinker.

These ends may be attained by the use of the following equipment:

1. The lengthening of the cooler-zone extension as part of the kiln, placing the burner within 20 to 30 ft. from the actual clinker discharge.

2. A series of small-diameter cooler drums, built around the outside kiln shell at the burning and cooling zone and rotating with the kiln, with chain restrictions for transmission of the heat to the air which passes freely through these drums and through port holes into the kiln, thus assuring the full benefit of the secondary air necessary for the combustion of the fuel with the primary air under automatic control to regulate the amount of excess air.

3. Air-quenching and pressure-type cooler, consisting of a grated apron or a reciprocating-type shaker conveyor with a large table area, built within a brick-lined steel inclosure, the red-hot clinker from the kiln being fed by gravity to the cooler through a hermetically-sealed clinker spout from the kiln hood and avoiding every possible cold air infiltration.

A blast of air is induced and forced uniformly through the bed of slowly-moving clinker. This air is sufficiently heated so that when it strikes the red-hot clinker it rapidly increases its absorption of the sensible and radiating heat from the glowing clinker. This is effective in improving the flame temperature and final combustion of the fuel. The percentage of heated air for both primary and secondary use is automatically controlled, and its flow is restricted by a damper and compartment divisions to utilize only such heated air as is necessary for the most effective and economical combustion, holding excess air to the minimum. This type changes the characteristic of the clinker structure and produces a more easily grindable clinker, so that whatever additional power and maintenance cost is necessary to operate such a unit will be offset by the saving in the grinding.

4. The large-diameter bowl-type cooler with segmental shaker grates placed directly underneath the discharge end of a rotary kiln, carefully air-sealed to the brick-lined clinker spout and the cover plate of the bowl.

The clinker drops on a slotted-cone table feeder which rotates at speeds dependent on the quantity of clinker to be handled and from which it slowly travels toward the outer diameter of the bowl over the segmental shaker grates, the product falling through a blast of air into an oscillating chute which discharges the clinker on a conveyor at within approximately 50 deg. F. of atmospheric temperature. The entire equipment is incased, offering a neat and compact lay-out, eliminating every radiation loss and providing a cool burner-floor basement.

5. The standard rotary cooler underlying the kiln and connected to the clinker pit from which the hot clinker drops by gravity into the cooler. The air passing through the cooler takes up the heat from the clinker, operating on the stack draft of the kiln.

This installation has always been considered a fuel saver, and in comparison to the straight shaft-type clinker pit without a cooler accomplished a saving of 12 per cent. in fuel. The main obstacle to getting better results lay in the insufficient passage area and the restrictions, where the heated air from the red-hot clinkers enters the clinker-hood. A partial induced draft by means of the primary blower, with a cyclone collector to trap the suspended fine clinker dust, raised the efficiency. However, a small percentage only of this super-heated air could be used with success, interfering with the burning conditions, causing too close firing within the proximity of the kiln hood, and destroying the effect of true heat utilization. In plants where coal is used for fuel some of this hot air is also used for drying the coal and, with gravity-type coal driers, the equipment gives good results.

This type of cooler has usually been built too small, and not sufficient time has been allowed for the air used for secondary combustion to pick up the heat to full advantage.

The installation of flow restrictions, consisting of metallic heating elements, breaker and lifter plates and retaining screens for sizing the clinker, and the introduction of blast air, has practically doubled the efficiency, clinker leaving the cooler within 100 deg. F. of the atmospheric temperature.

6. Straight shaft-type coolers with drag chains suitably housed to allow air to pass over the hot clinker, have ripened into fuel efficiency, but not to the extent that they can be compared with the more modern and highly developed equipment.

7. Recuperators that force air through port holes from the outer kiln shell into the burning zone so that it filters through the red-hot clinker in the course of its travel are on the market.

8. Straight-type shaft coolers in which the clinker zig-zags its way by gravity into a drag-conveyor of suitable length properly housed, forced air passing over the moving hot clinker. These have shown fuel savings and superior quality clinker. This system is inexpensive and soon pays for its investment.

Radiation Losses from Kiln Shell.—Attempts have been made to insulate the kiln in order to reduce its radiation losses which comprise 10 to 12 per cent. of the entire fuel consumption.

In the burning zone, in which the temperatures are the hottest, insulation between the brick lining and the kiln shell has been disappointing inasmuch as a certain amount of cooling from the outside is required to protect the lining and to assure a continuity of operation. Brick to withstand these extremely high temperatures has not as yet been developed. It is, however, possible that the high abrasive, high heat-resistant magnesite brick, now on the market, used with a balanced heat-insulating material may solve the problem and effect a considerable saving. However, insulation, back of the burning zone to the feed end of a kiln and extending approximately two-thirds of the entire length has been successfully used, and the reduction in radiation losses paid for the attempts within the first year of its installation. In most cases a silo-cel calcined brick is used for this purpose and will give years of service, but there are other insulating materials on the market that give promise of equal results.

Power.—Only a small amount of power is required to rotate a kiln, if it is properly designed and perfectly aligned and if it is provided with either ring-oiling or roller bearings to keep frictional losses at the minimum.

For the control of the speed of a kiln the variable-speed a.-c. motor with a resistance controller and placed in synchronism with the kiln-feed mechanism is probably the most economical driving unit. Signal lights on the burner floor should be adopted as a check on the proper working condition of the equipment.

The bulk of the power is used as follows:

Burner blower, furnishing 25 per cent. of the primary air.

Cooler blower, furnishing the secondary air for the completion of combustion.

Stack exhaust fan, for the withdrawal of the kiln exhaust gases.

Coal-feeding mechanism or oil-feed pump.

Cooler drive.

Handling and conveying mechanisms for carrying the raw material to the kiln feeder, for dust and clinker transportation, which also includes the calcinator or similar device.

The total kiln power requirements average about 10 per cent. of the total power required to produce a barrel of cement.

Gas Analyzers and Recording Instruments.—A further improvement, which

(Continued on page 44)

The Lubrication of Equipment

I. Pneumatic-Drilling Tools

By JAMES I. CLOWER

Mr. Clower is associate professor of machine design at Virginia Polytechnic Institute and is an outstanding authority on the subject of lubrication, having written more than fifty articles on various phases of the subject for the technical press. At present he is engaged in the preparation of a book on Industrial Lubricants and Lubrication which will probably be published early next year. This article is the first of a series which Mr. Clower is preparing especially for PIT AND QUARRY on the subject of lubrication of equipment used in the field.

WEAR and tear on pit-and-quarry equipment is very rapid because of the inherent rough nature of the work and the exposure of the equipment to all sorts of weather. The air generally contains considerable grit and dirt, much of which is usually very abrasive. Much of the equipment also is usually exposed to rain, and not infrequently hand tools, such as air-operated drills, are dropped into water puddles. Because of the operating conditions and surroundings and despite the clever oil and grease seals it is impossible to exclude all water and dirt from the bearings, gearings and other moving parts, especially when the equipment is not maintained in good mechanical condition. Admissibly, regardless of the maintenance practiced, the useful life of this equipment is short compared with other classes of machinery.

Such rock drills as sinkers, drifters, stopers, etc., are subjected to service at least as severe as, if not more so than, that of general pit-and-quarry equipment. These tools actually "breathe" the dusty air and, as a rule, are left much of the time in the open, even when not in use. These tools are unquestionably precisely and durably made of fine materials, but unless properly cared for their life is comparatively short. In this connection correct lubrication is the most important single factor.

Briefly, the benefits of correct lubrication are:

(a) Higher efficiency as indicated by increased footage drilled per shift and decreased air consumption.

(b) Increased life of tool as made evident by decreased wear, thereby reducing maintenance costs.

(c) Reduced air consumption by providing essential oil seal between piston and cylinder.

(d) Fewer "dry tools" during operating periods and less rusting during idle periods.

All these factors act in combination to decrease operating, maintenance, power, depreciation and lubrication costs.

Correct lubrication involves not only the selection of a proper lubricant for the service and tool at hand, but also a practical and systematic application of the lubricant in the correct amount at all times.

Methods of Application

Generally, the lubricant is applied to these tools by one or a combination of two of three methods, as follows:

(a) Hand oiling; (b) Pulsation oiling; and (c) Air-line oiling.

Hand Oiling.—The most common method of hand oiling these tools is to pour oil or semi-fluid grease into the air-hose connection at the tool. This is obviously a very inefficient and wasteful method, because much more lubricant than is required is generally used, much of which in most cases is spilled on the ground. Due to the excess of lubricant usually poured into the tool much of it is blown out the exhaust immediately the tool is started, having rendered little if any lubrication. Moreover, operators frequently neglect to oil until the tool slows down or stops. In such an instance the tool operates for considerable time without adequate lubrication and as a result the moving parts wear rapidly, overheat, and frequently score or scuff.

An improved method of hand oiling is accomplished by means of the cup oiler shown in Fig. 1. This oiler, attached by means of a T-pipe fitting to the air-line close to the tool, affords a means of measuring the amount of oil introduced into the drill. And, since it has a funnel-shaped opening, less oil is likely to be spilled. In these respects it is an improvement over the practice of pouring oil into the hose connection. It does not, of course, prevent the operator from forgetting to oil at the required period.

When the handle is turned vertically upward, as shown, the cup can be filled with oil. Turning the handle down empties the oil charge into the air-line, whence it is carried by the air stream in a "slug" or "slugs" into the tool.

Pulsation Oiling.—Although pulsation oilers are of many designs and shapes, yet they all operate in a manner similar to that of a heart.

The air within the cylinder of a pneumatic tool is subjected to rapid pressure changes, due to the reciprocating motion of the piston. Referring to Fig. 2, as the air pressure in the cylinder builds up some air flows upward and opens the ball valve and escapes into the space above the oil. While the ball valve is open, a minute quantity of oil seeps into the cylinder and is distributed by the air over all rubbing surfaces with which contact is made. When the exhaust port opens, the air pressure in the cylinder drops and the ball valve closes, thereby shutting off the oil feed to the cylinder. Obviously, this type of oiler provides a minute supply of oil to the cylinder on each stroke of the piston.

Some pulsation oilers are designed so as to feed an extra quantity of oil whenever the throttle valve is closed, thus providing ample lubrication when the tool is again started.

This type of oiler operates very satisfactorily provided all the air and oil ducts leading to and from the oil reservoir are kept open.

Regardless of the type of tool and de-

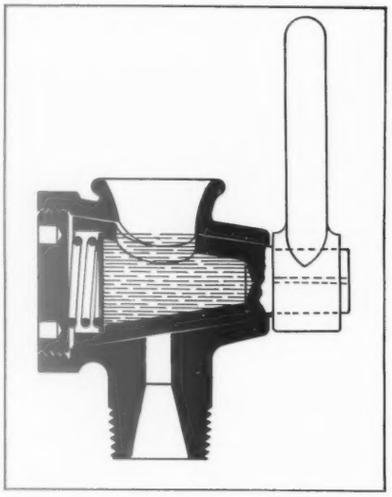


Fig. 1

sign, these oilers should be filled at least twice during each shift of 8 hr. In some cases, where a tool is operated practically continuously, three or more fillings may be necessary.

Air-Line Oiling.—The air-line oiler is a very efficient device for applying oil to pneumatic tools. It circumvents the objection to refilling the pulsation oiler during the operation period as its capacity is generally sufficient to allow

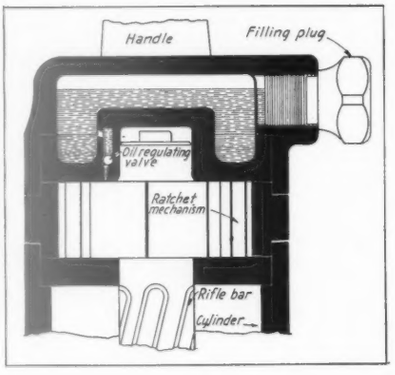


Fig. 2

filling at night for the next day's work. It is fully automatic and requires only a thorough periodic cleaning.

Several air-line oilers operate on the principle of the common spray gun (Fig. 3). One design, however, makes use of the capillary properties of felt wicking for carrying the oil from the chamber into the air line (Fig. 4).

All air-line oilers are so designed that they operate regardless of the direction of air flow. Some, however, do not operate satisfactorily when placed in a vertical or inclined position.

Air-line oilers for most effective lubrication should not be placed more than 15 ft. from the tool. Some object to placing them so close because of the increased difficulty in dragging the hose when moving the tool. If they are placed too far from the tool, the oil will not be thoroughly dispersed in the air, consequently it will enter the tool in slugs. Under these conditions it is generally necessary to increase the rate of feed in order to secure good distribution throughout the interior of the tool. It is also recommended that each tool be provided with an individual oiler, otherwise some tools will probably receive less than their proportional part of the oil.

Service Factors and Oil Requirements

In addition to the method of application, the following six factors are of major importance as they require that certain properties be had by the lubricant if it is to render efficient and effective service: (a) water; (b) temperature; (c) air impurities; (d) air pressure; (e) forces; and (f) drill speed.

Water is usually present in pneumatic tools in the form of either liquid, vapor, or both. Air always contains some moisture. The term "dry air" is relative; it simply means that any given air is drier than some other air used as a standard of comparison. Moisture is always "squeezed" from air when compressed at constant temperature, because of the reduction in volume. The action is similar to squeezing a wet sponge. Temperature, however, has an opposite effect upon the capacity of air to retain moisture. Roughly, each 20 deg. F. increase in the temperature of the air doubles its moisture-carrying capacity. The result is that in compressing air the rise in temperature due to compression increases its capacity to carry moisture at a greater rate than the decrease in volume reduces it. As a result of this temperature-pressure effect, compressed air leaves the compressor carrying *all* the moisture it contained as free air. In fact, it will absorb more moisture should it come in contact with water.

However, if the air is conducted through long pipes or is stored in receivers, it cools and consequently some of the moisture condenses. But if provisions are not made for its removal much of this condensate will be carried along by the flow of air as free water and will enter the tools.

Where the wet-type of tool is employed, additional water may, if the connections are not tight, come from the supply used for removing the cuttings from the drill hole. The amount of water coming from this source depends mainly upon the mechanical condition of the tool and the care of the operator. If the water-tube connection at the backhead of the tool is kept well packed, if the water tube extends into the drill-steel shank 1 in. or more, and if the operator carefully regulates the water supply to form a thin paste of the

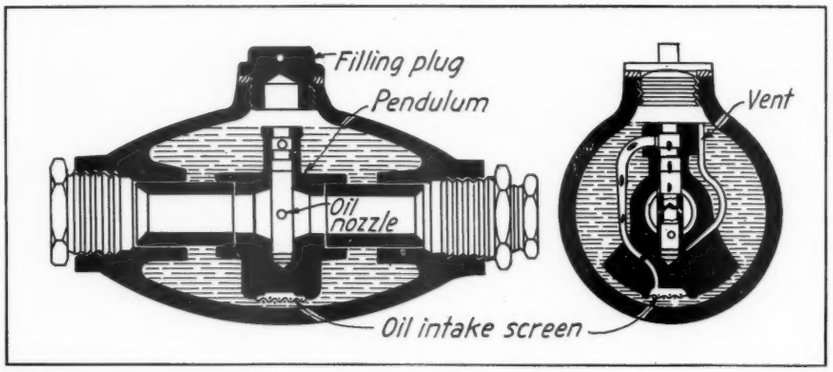


Fig. 3

cuttings, little if any water will get into the tool from this source.

Water in pneumatic tools tends to scrub the oil films from the rubbing surfaces. Unless the lubricant is correctly compounded and of the right viscosity or body, the oil film will be washed off and metal-to-metal contact will occur, resulting in increased friction, wear and overheating.

Quarrying is done in all sections of the world, from the tropics to the frigid north. Consequently, pneumatic tools are required to operate in temperatures above 100 deg. F. as well as many degrees below zero. Naturally, under these varied conditions drills operate over a wide temperature range.

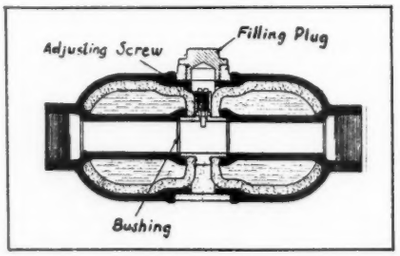


Fig. 4

Moreover, the expansion and compression of the air within the cylinder has an effect upon the operating temperature. At the exhaust port it is not unusual for ice or frost to form. And, when a tool is allowed to "over-stroke," flames may shoot from the exhaust, due to excessive compression pressure.

Obviously, the lubricant must possess properties that will allow it to flow freely at low temperatures and spread uniformly over all rubbing surfaces, and at the same time, under high-temperature conditions, it must possess the

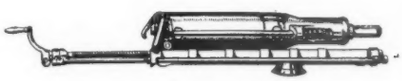


Fig. 5

requisite body to form tough, tenacious film that will prevent metal-to-metal contact.

In quarries it is difficult entirely to prevent dust, dirt and other impurities from getting into the intake air of the compressor. In addition, other impurities, such as scale, rust, dirt, etc., are found in the air-transmission lines.

To a certain extent many of these solid impurities are carried by the air into the tool, thereby contaminating the lubricant and adversely affecting the formation of oil films.

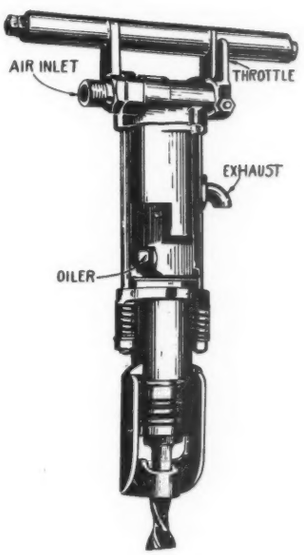


Fig. 6

Many of the impurities of the air may be eliminated by locating the intake of the compressor in clean, cool surroundings and providing it with an efficient air-filter. Thoroughly cleaning the air before it is admitted to the compressor pays dividends on the cost of the best air-filter obtainable.

Considerable benefit will be derived by blowing the air lines before attaching the tool. This practice cleans the lines of any impurities that may have collected during the idle period.

Fig. 7

Air pressures are generally not higher than 100 lb., which can not be considered high. Line pressure, however, is not a criterion as to the maximum pressure, that may exist in a tool cylinder, because most tools are so designed that the piston is air-cushioned at the end of the strokes. This air-cushioning increases the pressure well above that of the line.

It is common practice to grind off the small end of the piston when it has worn. Likewise, the drill-steel shank is frequently ground. This practice may cause the piston to "over-stroke", and result in excessive compression pressure accompanied by a corresponding temperature increase.

The lubricant, therefore, is required to adhere to the metal surfaces under high pressure and temperature conditions and at the same time form a film of the requisite strength.

The rifle-bar, chuck parts, rotating mechanism and other parts are subjected to heavy impact forces. The flutes or splines on the rifle-bar and in the rifle-bar nut are not only subjected to extreme pressures but are also subjected to high sliding action, which produces rapid wear unless they are at all times completely covered with a film of oil.

The stratification of the rock often causes misalinement of the drill steel and chuck parts. This throws excessive loads on the chuck and its bushings. The movement of these parts is so slow that the lubricant is not carried into the small clearances unless it possesses the

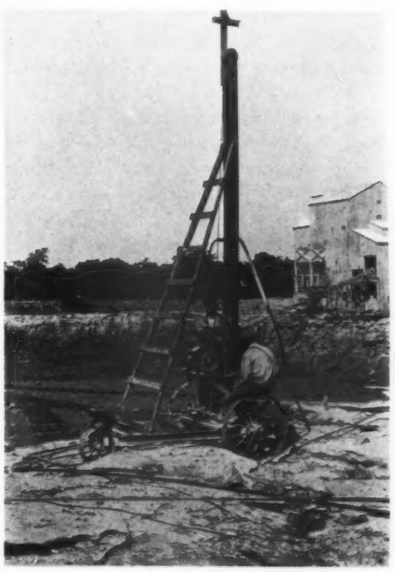


Fig. 8

ability to creep into small spaces. A light-bodied oil will creep, but it does not possess the necessary body to withstand the heavy pressures usually existing between chuck parts. It is, therefore, important that the lubricant be of sufficient body to withstand the heavy pressures and at the same time be capable of creeping into small clearances.

While the number of blows struck per minute by a pneumatic tool varies

(*Continued on page 44*)

TABLE I.—Recommended Lubricants for All Sizes and Types of Rock Drills

Lubricant	Viscosity (S.U.S.)			Pour Point (*Deg. F.*)	Fire Point (*Deg. F.*)	Flash Point (*Deg. F.*)	Compounding* (*per cent.*)
	100 Deg. F.	130 Deg. F.	210 Deg. F.				
Oil A	1,100	440	90	10	400	360	17
Oil B	575	240	60	10	385	350	16
Grease C	A high-grade, water-resistant lime-soap grease of soft consistency (No. 2). It should be neutral, that is, should not contain any excess free fatty acid or alkali.						

* Compounding refers to the percentage of animal or vegetable oil added to mineral oil. By compounding a mineral oil its surface tension is reduced and, as a result, the compounded oil adheres more strongly to wet metal surfaces.

Oil A is recommended for heavy mounted tools (drifters, etc.) operating under severe conditions.

Oil B is recommended for all light hand-held tools (sinkers and plug drills) and light mounted machines operating under any conditions. Satisfactory mixed- and naphthene-base oils are also available outside these viscosity ranges.

Some drills have a pulsation oiler located in the front head (see Fig. 3) for supplying lubricant to the chuck parts. These tools in general require grease. A grease which conforms to the specifications as given above will generally meet in full the lubrication requirements of these tools.

LIME PRODUCTION PROBLEMS

BY W. R. CLIFFE

Fuel Economies of the Rotary Lime Kiln

IT would be fairly simple to estimate the millions of dollars worth of sensible heat which has made its exit through the rotary kiln chimneys of the lime and refractory-dolomite industries in this country alone in the last twenty years and to express it in kilowatt-hours of electrical energy, a solid train of railroad cars loaded with coal reaching from Kansas City to goodness knows where, boiler horse-power, or other terms. But it is sufficient to say that if your coal input is greater than from 16 to 19 per cent. of your outtake of finished goods, you need to investigate and find out why.

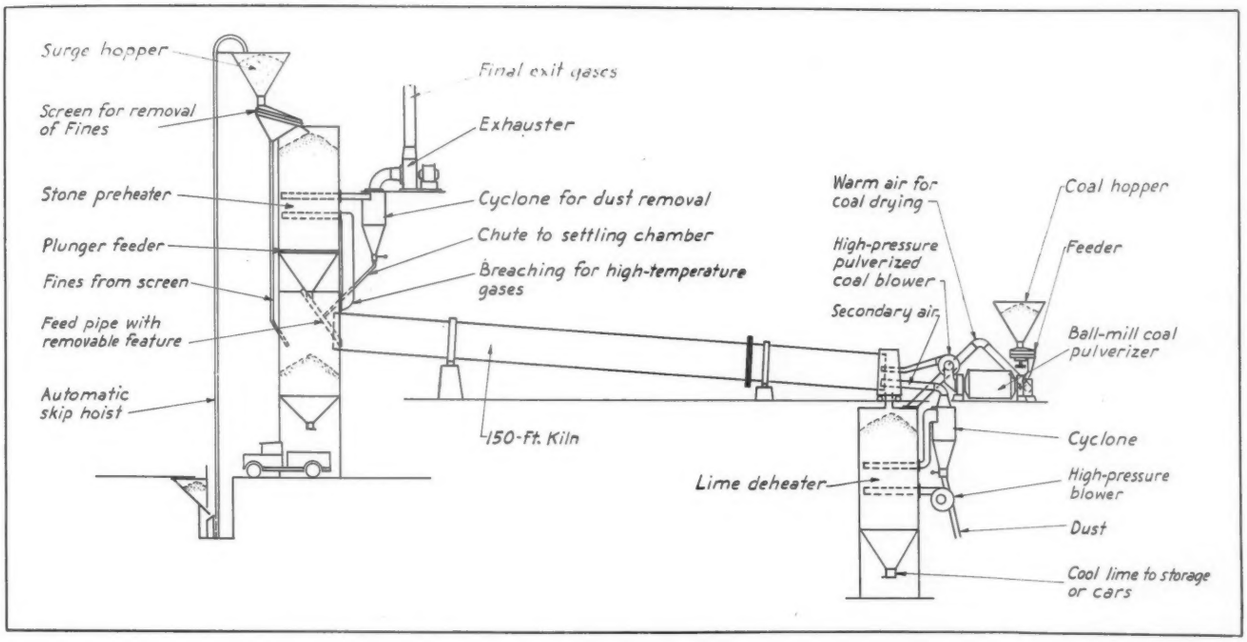
There are ways too numerous to mention in which this waste could be utilized in other manufacturing processes, but much difficulty accompanies the combining of unrelated industries. Therefore, it remains for each operator of this type of equipment to control his own waste. Of course, as long as entire industries are common offenders, the purchasers of their products continue to pay for the waste as part of the value of the commodity, but sooner or later some operator will apply corrective measures in his plant and the savings will be so unbelievably large that he will immediately undersell the market and his competitors will be forced to take similar corrective steps. This is an elementary cycle but, nevertheless, it is the process by which many important achievements arrive.

The conservation of fuel was undoubtedly the major thought which prompted the installation of the four long rotary kilns which went on the production line last year but, as mentioned in preceding discussions on this subject, the expected lime-to-coal ratio has in most cases failed to materialize proportionately to the length or capital outlay. The majority insulated the lining with the exception of the burning zone, where the liners rest against the shell of the kiln. However, in one of the kilns which has had considerable publicity the burning zone was disregarded and insulation was placed throughout the length with the exception of the extreme feed end where, for a substantial distance, there is no lining whatsoever, the charge rolling on the shell of the kiln. Difficulties were experienced and, as liners in the hot zone are not renewed, what remains of the old insulating material is removed and the new bricks are placed against the shell. In this instance if it were not for the deliberate admission of cold air for tempering purposes and the radiation losses through the unlined section at the feed end, the stack temperatures would closely approach those of the much shorter kilns. With exit gas temperatures of 1,200 to 1,400 deg. F. there can be no appreciable fuel saving, so that the long kiln in itself is not the answer.

It might be said that the only reason for increasing the length of the kiln to 300 or more ft. is to allow a sufficient reduction in gas temperature to take place normally, so that elements of heat-resisting metal (which still have very definite exposure limits) can be used to assist in the transfer. Where equipment of this kind is employed, the man who pays the coal bills swears by them and the fellow who repairs the kiln swears at them. During recent years metallurgy has contributed tremendously in alloy steels that not only will withstand extended exposure to semi-high temperatures, but also possess abrasive resisting qualities. This method of heat transfer through metals has demonstrated its ability to perform the desired function in some instances, but local conditions frequently make its use impractical. Furthermore, the initial outlay is known to be very high and as successful applications are rare, consideration of such a scheme should be approached advisedly.

Numerous attempts have been made from time to time with various devices intended to utilize the high-temperature gases passing from rotary lime kilns, culminating in the arrangement described by Theron C. Taylor before the annual convention of the National Lime Assn. in 1937. Since that time, however, much laboratory work assures the ultimate success of the preheater. It is now possible and practical to transfer more heat to the stone through a few inches of proper exposure in a preheater than can be accomplished by normal progression through 100 ft. of the cold zone of a rotary kiln. The efficiency of the stationary bin type preheater as a means of heat recovery is bound to be very great as radiation losses are extremely low. The problem of heat conservation by insulation is much reduced from the corresponding problem in the rotary kiln, so the only other questions which pertain to the utilization of rotary-kiln exit gases that are as yet not generally known are: Can the stone level of rotary-kiln feed-size stone be lowered slowly and evenly over a broad area in order that uniform exposure to high-temperature gases is obtained? Can the time element of exposure be controlled? Is the process sound practically? Perhaps the greatest difficulty which had to be overcome was that of channeling or the traveling of stone through one section of the preheater faster than another. This in itself is the keystone to systematic and complete heat recovery. When channeling occurs, the gases, because of less resistance, follow the fastest moving stone, so that the dormant section soon becomes choked and useless. By the use of a special bin design, a careful withdrawal method, and an arrangement of inverted angles in parallel the rotary-kiln exit gases enter the preheater through inlet ducts and are drawn off through outlet ducts. The distance between the hot-air ducts, being capable of adjustment, determines the extent of preheat and the draft losses. The stone under treatment moves evenly and smoothly through the bin, distribution being practically perfect; thus the answer to the first two questions is definitely affirmative.

The picking up of small particles of stone and dust by the hot moving gases originally gave much trouble, but when stone channeling was overcome this difficulty eliminated itself. It was only natural that the gases passing through a restricted area—the section through which the stone was moving—would by increased velocity carry much fine material which would invariably settle out in the wrong place and noticeably shorten exhauster-impeller life. With an even distribution throughout the stone-bed area though, fine sizes are not disturbed. Of course, the presence of dust and fine particles of stone in the feed is always detrimental to good rotary-kiln practice and should be eliminated regardless of preheating. Preheating should be especially attractive where washed stone containing a high percentage of moisture is used as feed.



In such cases the saturated stone is first exposed to lower temperatures which have the effect of driving off moisture slowly, thereby avoiding the creation of pressure resulting in steam and the breaking open of the stone when it is passed through a feed pipe into 1,400- and 1,500-deg. gases. Explosion doors in the preheater are important, but very slight danger exists if sealing rings are kept tight and the CO and H_2 in the exit gases is maintained in the neighborhood of .1 per cent. With a stone bed of from 10 to 21 in. and draft losses of from 3 to 7 in., temperatures of the gases entering the preheater as high as 1,600 deg. F. are reduced to minus 300 deg., and as much as 12 per cent. surface calcination is obtained, so the answer to the third question as to "sound practicability" is also "yes."

By way of comparison it is interesting to note that in a 175-ft. kiln surface calcination is hardly noticeable until the charge has reached a point approximately 90 ft. from the discharge end of the kiln, and in the experience of 300 ft. kilns with insulated linings the charge moves to approximately the same point before equal calcination is noticeable. Hence in the former the charge has moved approximately 85 ft. and in the latter instance roughly 200 ft. to reach the same degree of calcination possible in the preheater.

In order to give some idea of the original cost of purchasing a rotary kiln the following approximate figures have been prepared. They do not include foundations, hoods, coolers or seal rings, merely the bare shell with tires and bearings.

Cost of Rotary Kilns

7-ft. by 100-ft. kiln	2 tires	$135 per ft.
7-ft. by 120-ft. kiln	2 tires	143 per ft.
8-ft. by 125-ft. kiln	2 tires	160 per ft.
8-ft. by 140-ft. kiln	2 tires	166 per ft.
8-ft. by 150-ft. kiln	2 tires	173 per ft.
8-ft. by 175-ft. kiln	2 tires	178 per ft.
8-ft. by 200-ft. kiln	2 tires	171 per ft.
8-ft. by 300-ft. kiln	4 tires	218 per ft.
9-ft. by 150-ft. kiln	2 tires	201 per ft.
9-ft. by 175-ft. kiln	2 tires	204 per ft.
9-ft. by 200-ft. kiln	4 tires	207 per ft.
9-ft. by 250-ft. kiln	4 tires	208 epr ft.
9-ft. by 300-ft. kiln	4 tires	223 per ft.
10-ft. by 175 ft. kiln	2 tires	225 per ft.
10-ft. by 200-ft. kiln	4 tires	236 per ft.
10-ft. by 300-ft. kiln	5 tires	220 per ft.
11-ft. by 250-ft. kiln	4 tires	247 per ft.
11-ft. by 310-ft. kiln	5 tires	251 per ft.

Let us take, for example, the total cost of the 8-ft. by 150-ft. kiln and compare it with the total cost of the 8-ft. by 300-ft. kiln and it will readily be seen to be considerably more than double in first cost. To this must be added maintenance and lining in practically the same proportions.

At this time it should be mentioned that the length of the kiln, when other factors are included, has a strong bearing on economy as far as coal consumption is concerned but has no effect whatever on the production rate. Therefore, if careful consideration is given to first cost, lining, maintenance figures and comments herein mentioned, little difficulty should be experienced in purchasing a preheater which will at least equal the operating efficiency of the long kiln from the difference between the 150-ft. and 300-ft. kilns in shell cost alone.

Well known are the three stages in the making of lime in a rotary kiln: preheating, actual calcining, and deheating. In the first instance we try to recover the excessive temperatures created in the second phase, and in the third stage an effort is made to transfer (latent) heat from the completely- or nearly-burned lime in as short a time as possible to the primary and secondary air used for combustion. In existing technique very little control of the rapidity of combustion is possible, and as the zone of actual disassociation is comparatively short, especially when pulverized coal is used as fuel, the section of the kiln has sometimes been increased and corbels of brick have been built to retain the charge in this area as long as possible.

However, it has never been conclusively proved that lime moves through and leaves such an enlargement or restriction in the order of its entry. Both methods are high in first cost, carry structural difficulties and have a tendency to increase the percentage of lime spallage. In the preheating zone festooned chains, brick baffles and other devices have been used to alter gas stratification and expedite the recovery of available heat. In many instances the desired results have been hardly noticeable, but increased maintenance costs have been much in evidence. Therefore, it seems that the rotary kiln should serve chiefly as a calcining agent, with its diameter unaltered and its length not over 150 ft., its function being to raise the temperature of the preheated charge to the necessary stage and discharge it when the burning is complete. By so

doing we keep our kiln structurally sound with the simplicity of 2-bearing support, low in operating and maintenance as well as first cost.

Then by reversing the process of preheating we accomplish deheating, which process carries even more attractive features than its counterpart at the other end of the kiln. According to the size of the deheater, the hot lime still more than 500 deg. F. above the decomposition point can remain in the carefully insulated section for any desired period of time. To those of the opinion that the cooling rate alters vital characteristics in the lime, such control should be very attractive. As the lime moves evenly down through the grate section, the degree of heat desired is extracted and the temperature of the secondary air raised accordingly. However, in this procedure, it will be seen from the diagram, the position of the fan places the deheating section under pressure and by so doing the necessity of an expensive unit for handling air and gases of high temperature is avoided.

In many rotary plants the cooling of the product is of tremendous importance, but unfortunately the lime industry has tried to apply coolers that were originally designed for service in other industries, where the requirements are not so exacting. To the best of the writer's knowledge there is not a practical mechanical device for the effective cooling of lime in service anywhere. Because of this weakness, one of the most important phases in the process has been neglected, the general idea being "anything to get the lime cool enough to transport on conveying equipment and load in wooden boxcars." Furthermore, the modern rotaries are capable of a wide production range; this flexibility is of outstanding value in periods of business instability but unfortunately the cooler is invariably the limiting factor. Some aftercoolers do a fairly efficient job in the lower kiln-output range, but when the operator desires to avail himself of the advantages of the upper-bracket qualifications of his kiln, he finds his cooler restricts him to very definite limits. With stationary deheaters of proper size their mild treatment of an easily breakable material, their time-control factor, their extremely-low maintenance cost should be of vital interest to all lime producers.

Lubrication *(from page 41)*

with size, make, and design, yet the average rubbing speed of the piston is generally about 1,000 ft. per min. The force of the blow struck varies as the square of the velocity at the instant of impact. Although the average speed is comparatively low, yet the speed at the instant of striking the drill-steel is usually between 2,000 and 3,000 ft. per min. It is, therefore, desirable that the piston be moving at a high rate of speed when it strikes the drill-steel. A slowly-moving piston not only strikes fewer blows per minute but also less effective blows.

Only an oil of the correct body at the operating temperature, capable of maintaining complete oil films over all rubbing surfaces will insure the lively piston and valve action so essential to secure maximum drilling speed.

Recommended Lubricants.—From the foregoing discussion it may be thought that it would be necessary to use several different lubricants of wide-varying characteristics in order to meet the exact requirements of rock drill lubrication. Such, however, is not the case, as many years of actual experience has demonstrated that rock drills under all conditions can be effectively lubricated by not more than three lubricants of the typical analyses indicated in Table I.

Rieth *(from page 38)*

has put the entire kiln control into the hands of plant management, superintendent and chemist, has been the adoption of gas analyzers for the determination of the carbon dioxide and monoxide gases to check the heat balance and fuel consumption in connection with control of the air for proper combustion with the least excess air.

Electrically-operated stack dampers, actuated by draft-pressure instruments, have materially reduced ring troubles in the feed end as well as in the final decomposition zone, thus increasing the kiln-hour efficiency and the continuity of operation.

Pyrometer control apparatus, indicating and recording instruments, for temperature control at the stack and the discharge end and with thermostatic control for the secondary and primary air have been used successfully, effecting savings, functioning as a self-exercising medium to relieve the kiln burner of his responsibility for irregular production, and eliminating low kiln efficiency.

May Develop Island Magnesite Deposits

According to the U. S. Bureau of Mines, the Venezuelan government is very much interested in developing the magnesite properties on the Island of Margarita, not so much for revenue, perhaps, as to furnish a livelihood for some 60,000 people on the island who have almost no employment yet wish to remain there. So far no other deposits of magnesite of any importance are known in Venezuela, at least none has been operated.

The deposits were first exploited in 1907, the material being used for manufacturing carbon-dioxide gas as well as calcined magnesite. After many ups and downs, the properties are being considered again for exploitation.

Development work is reported to have proved the existence of large beds of exceptionally pure magnesite close to the surface and cheaply mineable by quarrying methods. In 1916 the price agreed upon was $10 a ton, free alongside vessel, and the cost of production was around 25 bolivares (equal at that time to about U. S. $5) a ton, of which about $2 was for quarrying and the remainder for development work, transportation, loading boats, royalty, and other expenses. It was thought that the cost of production might be reduced considerably in time.

Some time ago, it is understood, formation of a company among the Venezuelans to work the mines, in case the government should take them over, was contemplated but no one seemed to have the necessary experience either to evaluate the properties or to manage and develop them, so that for the time the idea was abandoned. Expert advice from outside technical men is needed, and the employment of chief personnel from abroad is required for the mines if the government is to develop the magnesite properties. However, it is probable that should some company of good standing and resources approach the present owners or the government, satisfactory contracts for development or outright purchase could be effected.

Feldspar Production Reaches Highest Level

The feldspar industry in 1937 again broke all previous production records, sales of crude topping the 1936 peak by 10 per cent. and sales of ground spar surpassing by 18 per cent. the 1936 high, according to the Bureau of Mines. Low-cost western feldspar largely increased its share of the total output. Technical research by the National Feldspar Assn. on effects of feldspar in glassmaking, refinements in methods of chemical analysis of feldspar and studies of the application of froth flotation and agglomerate tabling to feldspar recovery reflect the keen competitive situation in the industry.

Of particular interest is the use of nepheline syenite to replace feldspar in whole or in part in the container glass industry. A modern processing plant at Rochester, N. Y., is now grinding and refining the crude material shipped in from Canada. It is estimated that possibly as much as 10,000 tons of nepheline syenite may have been imported from Ontario during 1937. Research now in progress forbodes possible further invasion of feldspar outlets by other minerals such as spodumene and pyrophyllite or by slags from certain process industries.

By W. E. TRAUFFER

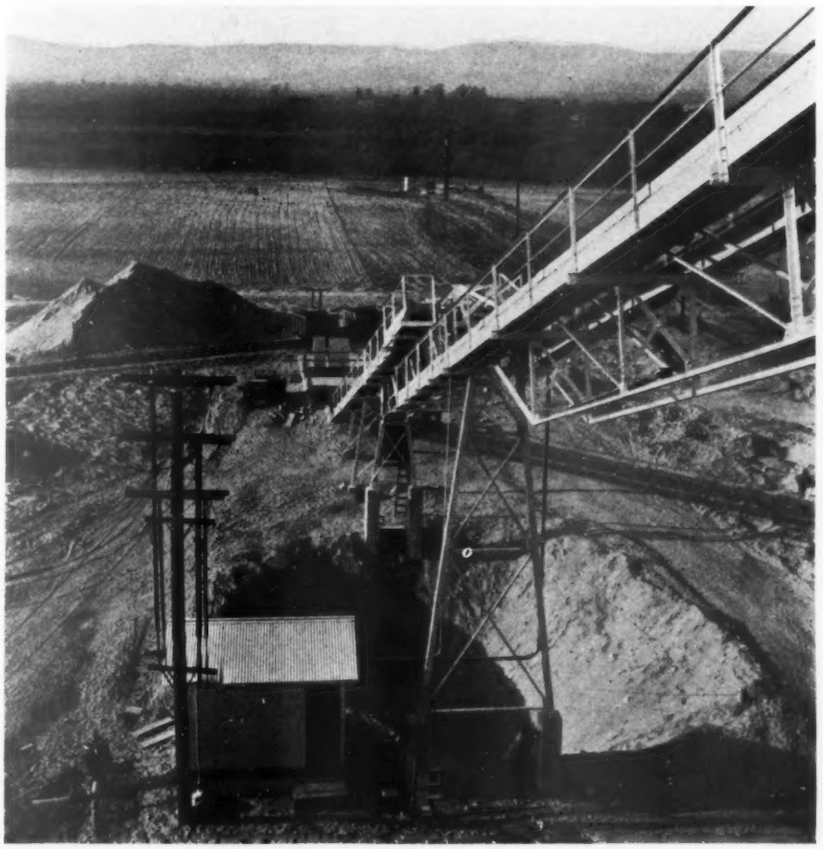
A California Gravel Plant Noted for Originality of Design and Operation

A view of the new plant of the Saticoy Rock Co. while still under construction which illustrates the unusual design of this all-concrete structure.

ONE of the most interesting of the many new sand-and-gravel plants built in 1937 is that of the Saticoy Rock Co. near El Rio, Cal. Designed by J. C. Buckbee, a member of the company's board of directors, this plant embodies many original features of mechanical and structural design and of operation, and requires little equipment considering the capacity. It is patterned to some extent after Mr. Buckbee's conception of an ideal sand-and-gravel plant as built for the Eau Clair Sand-Gravel Co. and described in the May, 1933, issue of PIT AND QUARRY. Although designed to produce 100 tons per hr. with 20 per cent. crushed material, this plant easily produces 125 tons per hr.

This plant is located in the Santa Clara River valley, 3 mi. north of El Rio. The deposit is in the plain of this river, which is the chief source of aggregate supply for Ventura and Santa Barbara Counties. This plant went into operation in December, 1937, replacing another plant ¼ mi. north operated by this company for many years. This was a simple and efficient plant of wooden construction with a capacity of 90 tons per hr. The depletion of the deposit around this plant made it necessary either to move it or build a new plant, and the latter course was adopted.

The company owns a property of 45



Looking down the main conveyor from the plant at the track hopper. Under the surge stockpile pit in the foreground is a return conveyor.

acres on which the new plant is located and from which material is being excavated. An additional 700 acres of land in the old river-bed flood plain is under lease. Good sand and gravel are known to exist to a depth of 100 ft. A water well drilled on the property did not strike clay until a depth of 172 ft. had been reached. The depth of excavation will necessarily be governed by the elevation of the water table. This level is highest, about 40 ft., between February 1 and June 1, and drops to 65 or 70 ft. below the surface during the remainder of the year. For this reason a level about 35 ft. deep is being opened for wet-weather operation. A second level at 60 or 65 ft. will later be opened for operation during the dry season. The material in the deposit averages about 50 per cent. minus ¼-in. and 60 per cent. minus ½-in. There are very few large bowlders. About 20 per cent. of the material is over 3½ in. in size and will be crushed.

Cars being loaded with gravel by a crawler drag-line. Settling pond is at left.

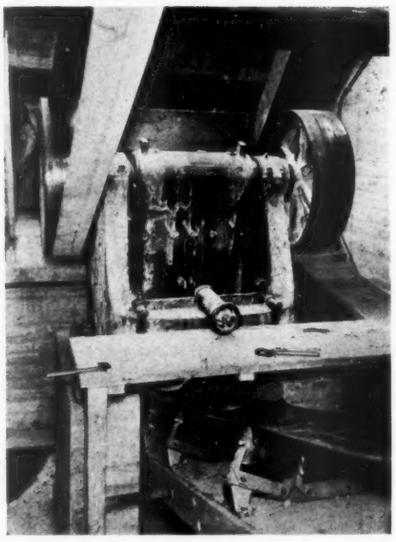
A crawler drag-line loads material into two 7-ton steel side-dump cars, which are hauled to the plant by a 7-ton Plymouth gasoline locomotive. The haul averages about 500 ft. Later more cars and an additional locomotive will be needed. The cars are of original design with side gates which are automatically released for discharge by a spreader between the tracks at the hopper. When the empty car returns over this spreader the gates are released and snap shut of their own weight. These cars are equipped with 10-in. flat grizzly bars, which the drag-line tilts when necessary to dump an occasional bowlder.

The contents of the cars are dumped into a circular concrete hopper of 50-ton capacity. The rails over this hopper are supported on I-beams instead of ties, so that the track can be turned to a new angle when pit operations have moved far enough to make this advisable. A 36-in. by 60-in. Stephens-Adamson reciprocating feeder discharges the material from the hopper on a sloping grizzly, from which the oversize goes into a 14-in. by 38-in. Alloy Steel Foundry Co. roller-bearing crusher. This is now set to reduce to 3½-in. minus.

The crusher product is discharged on a 24-in. by 146-ft. inclined belt-conveyor. The material passing through the grizzly drops on the belt-conveyor ahead of the crushed material. This conveyor can discharge on a 24-in. by 132-ft. inclined conveyor running to the plant or to a surge stock-pile below. When the upper conveyor belt is stopped the material simply overflows the skirt boards and the end of this conveyor and falls into storage. These conveyors have a pitch of 4 in. in 12 in., which is practical because of the high percentage of sand.

The discharge pulley of the stock-piling conveyor is 26 ft. above ground level and the stock-pile is formed in an excavation in the form of an inverted cone extending 26 ft. underground. A live storage of 800 tons is obtained in this manner. Material is reclaimed from the stock-pile through a concrete hopper, from which a 36-in. by 60-in. Stephens-Adamson reciprocating feeder discharges it on an inclined return belt-conveyor in a concrete tunnel. This conveyor is 24 in. wide and 136 ft. long and returns the material to the main belt-conveyor at a point under the grizzly and ahead of the crusher.

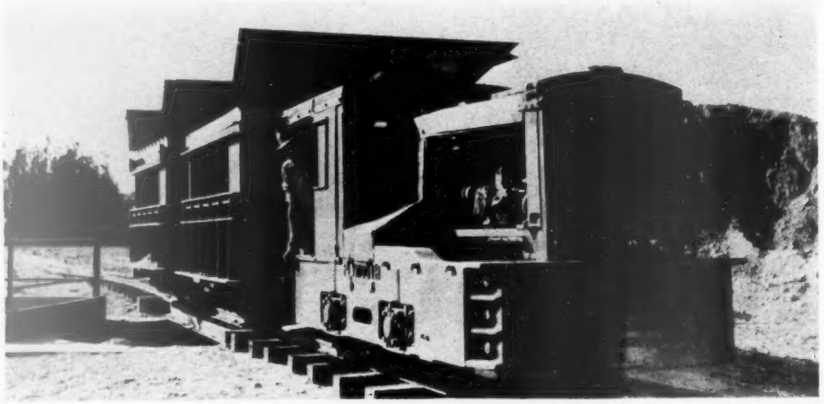
The second section of the main conveyor discharges on a 4-ft. by 8-ft. Stephens-Adamson heavy-duty, double-deck vibrating scalping screen. Wire cloth with 3-in. openings is used on the top deck and 1-in. wire cloth is used on the bottom deck. The oversize material is chuted into a 7-in. Allis-Chalmers Newhouse crusher, which is usually set with a 2-in. opening but can be set to crush down to ½-in. minus if desired. A 20-in. by 26-ft. belt-bucket elevator discharges the crusher product into a steel box, which has a rubber belt cover to retain the dust. The material can be discharged from this box either on the crushed gravel or rock screen or on a 24-in. by 14-ft. belt-conveyor feeding the gravel washing and sizing screen.



The 14-in. by 38-in. roller-bearing crusher with main conveyor to plant below.

The material retained on the bottom deck of the scalping screen can be fed to the Newhouse crusher or to the washed-gravel screen as desired.

The crushed-gravel screen is a 4-ft. by 8-ft. Stephens-Adamson triple-deck vibrating unit. It usually has two-

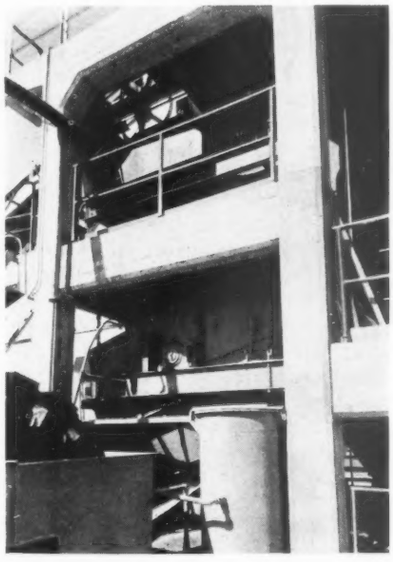


The 7-ton gasoline locomotive and the two 7-ton cars at the plant hopper.

thirds of ¾-in. and one-third of 1½-in. clear-opening wire cloth on the top deck. A steel plate under the 1¼-in. section carries this product to storage. The second deck has ⅜-in. clear-opening wire cloth. Two-thirds of the bottom deck has 6-mesh cloth with No. 16 wire and the other third has 2½-mesh cloth with No. 14 wire. The two fine sizes passing through the bottom deck are discharged into hoppers, from which they are chuted through 5-in. steel pipes into storage bins.

The four coarser products of this screen are discharged into four sections of a steel distributing box. Gates under this box make it possible to drop each of the four products into its separate bin or to combine any two or more sizes into bins in any desired proportions. The remainder of each size being combined goes to its individual bin. The distributing box has a hood on rails and rollers so that it can be rolled out of the way when working on the screen.

The material falling through the bottom deck of the scalping screen drops on a riffle of steel bars. Two 3-in. pipes



Two of the three vibrating screens used in this plant. At left is the sand dewaterer.

discharge water at the rate of 400 gal. per min. on the material sliding down these riffles, soaking it preparatory to washing and screening. The material and water flow on the 4-ft. by 8-ft. Stephens-Adamson triple-deck vibrating screen used for gravel washing and sizing. This screen has eight Chain Belt Rex spray nozzles. Usually it has two-thirds of 1-in. and one-third of 1⅜-in. clear-opening wire cloth on the top deck. A splitting plate under the 1⅜-in. cloth carries this size of product to storage. The second deck has ⅜-in. clear-opening cloth. Two-thirds of the bottom deck is fitted with 6-mesh cloth

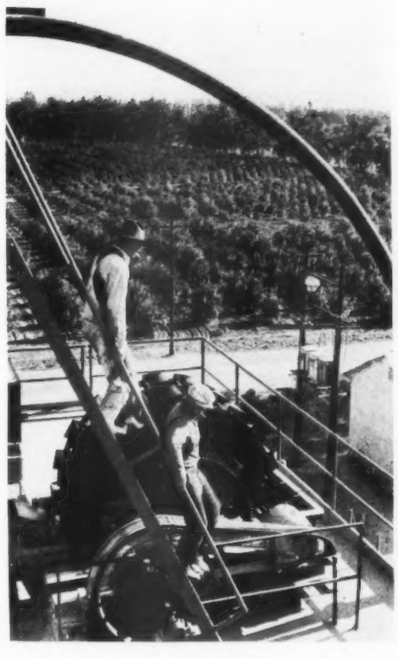
The circular plant hopper with one of the 7-ton steel cars. In the background is the 2-section conveyor to the plant.

with No. 16 wire for plaster sand or 4-mesh cloth for concrete sand. The other third has 4-mesh cloth with No. 14 wire for squeegee or 2½-mesh cloth for roofing gravel. The four sizes of gravel retained above the bottom deck of this screen are fed through a blending and distributing hood to storage. This hood is like the one on the crushed-gravel screen and serves the same purpose. The material which falls through the last one-third of the bottom deck also goes direct to storage.

The sand dropping through the first section of the bottom deck of the gravel screen flows through a flume into a dewaterer, which consists of a 4-ft. by 11-ft. by 4-ft. deep steel settling box with a bucket wheel revolving about half submerged in water. This wheel is supported on bearings resting on the top of the box and consists of an 8-ft. diameter steel disk, on each side of which 20 buckets are fastened. Each of these buckets is 14 in. wide and is made from 14-in. pipe cut in halves. Bolts passing through the extended side plates of these buckets fasten them to the disk, and steel links or stiffeners connect the ends of the bolts. Steel pegs in these links can be inserted in any of a series of holes in the outer sides of the buckets to change the pitch, regulating the capacity and the gradation of the sand produced.

Small holes in the bottom of each bucket help drain the sand picked up, and the movement of the bucket on its circular path after it is loaded causes water and silt to overflow back into the box. The sand is discharged from the buckets into hoppers on each side of the disk. Interchangeable lips of various widths on these hoppers can be used further to control the fineness of the sand. Swing chutes make it possible to discharge the sand into any of three bins. This wheel is operated at about 1 r.p.m.

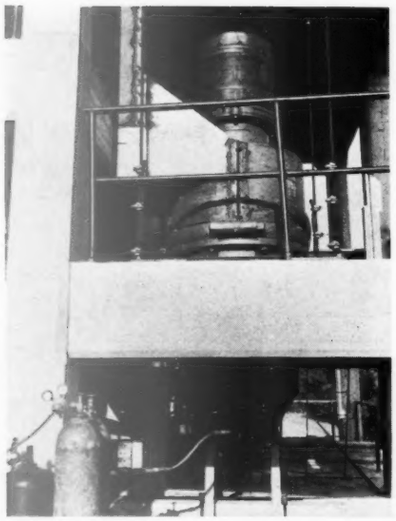
The overflow gate or weir on this box can also be raised or lowered to help control the gradation of the sand. The overflow goes to waste through a 10-in. pipe, which is supported by steel trusses in three 54-ft. bents carried on wooden line poles. A swivel spout makes it possible to discharge the waste into either of two 125-ft. by 50-ft. silt ponds. Weirs will control the overflow of clear water into a worked-out pit. At present this water is not being used for



The revolving sand dewaterer and classifier. Above is the nearly frictionless curve in the water line.

plant supply. The fine sand and silt deposited in the ponds will be dug out occasionally and sold as asphalt sand, etc.

The concrete bin structure supporting the plant consists of three rows,



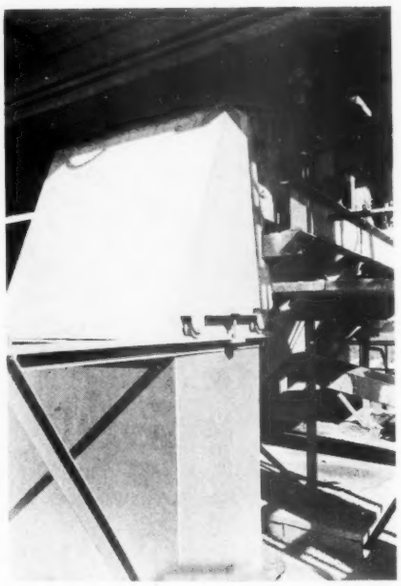
The 7-in. suspended-type gyratory crusher which reduces oversize from scalping screen.

each of four 120-ton bins. Truck-loading gates under these bins are of the reverse-arc type usually used for side discharge and are lever-controlled. A section of pipe welded to the bottom lip of each gate diverts the water draining out of the bin into a waste flume. Inside the bottom of each bin are perforated pipes which help drain off water.

Wash-water for the plant is supplied from a 172-ft. well by a 500-gal. per min. deep-well pump. The water-line to the top of the plant has only one L and this is at ground level at the plant. At the top of the plant a large arc eliminates friction. A hand-operated derrick on the top of the plant was used in its construction and will be employed for handling replacement and repair parts and supplies.

In addition to the local controls at each machine there are two remote-control Square D switchboards. Each of the switches in this board has a segment which can be removed or turned to make contact impossible. A workman repairing any machine can carry the proper segment in his pocket until the job is completed.

The use of automatic-dumping cars is said to save considerable time. The raw-material stock-pile makes the pit and plant absolutely independent of each other and makes available a reserve supply which eliminates expensive interruptions to plant operations caused by delays in the pit. In case of a slackening in demand the key men in the



The distributing box on one of the two final sizing screens can be rolled out of the way.

organization can be kept at full-time work by operating the pit end until the stock-pile is full. The plant can then be operated the remainder of the day.

The plant is constructed entirely of reinforced concrete and steel. An unusual feature is the hanging of the crusher and screens from heavily-reinforced concrete beams. Pipe openings through these beams are provided for future changes in, or additions to, the equipment. Openings covered with heavy boards have been left in the concrete floor under the screens to provide for future changes in design.

The attractive plant office which also houses the truck scale.

Wooden plugs embedded in the concrete down the center of each bin wall provide for future division of the bin by the introduction of a wooden partition. Each of the present bins has two discharge gates to provide for this change. Steel is used in all the stairways and walkways.

The Stephens-Adamson Mfg. Co. supplied the vibrating screens, the conveyor idlers and drives, and the two feeders. Pioneer conveyor belting is used exclusively. The two main conveyors have gravity take-ups and automatic backstops. U. S. ball-bearing electric motors are used throughout the plant. Most of the equipment is driven through Allis-Chalmers Texrope V-belts.

The Saticoy Rock Co. is a pioneer producer of sand and gravel in this section having been started about 15 years ago by the Orange County Rock Co., later purchased by the Saticoy company, a Ventura County group. In 1927 the Ventura Rock & Gravel Co. was purchased. In 1929 an interest was sold to the Consolidated Rock Products Corp. The Saticoy company also operates the sand-and-gravel plant at Ventura.

The directors of the Saticoy Rock Co. are: John Lagomarsino, president; Fred Smith, vice-president; Robert Mitchell, secretary; Arno Stovall; Frank Gautier; J. C. Buckbee; and Walter Moore, Jr. L. C. Corser is general manager and J. W. Smart is sales manager. Mr. Buckbee designed this plant, with the assistance of Mr. Corser and R. C. Griffin, and acted as consulting engineer.

MOTORS AND DRIVES

	Size	Motors Make	Drive
Primary jaw crusher	40-hp.	U.S.	Texrope
Reciprocating feeder	7½-hp.	U.S.	Texrope
Main conveyor: First section	15-hp.	U.S.	Texrope
Second section	15-hp.	U.S.	Texrope
Return conveyor	15-hp.	U.S.	Texrope
Scalping screen	7½-hp.	U.S.	Texrope
Gravel screen	10-hp.	U.S.	Texrope
Rock screen	10-hp.	U.S.	Texrope
Secondary gyratory crusher	60-hp.	Allis-Chalmers	Direct
Oil pumps	1-hp.	Allis-Chalmers	Direct
Bucket-elevator	7½-hp.	U.S.	Texrope
Sand wheel	7½-hp.	U.S.	Texrope
Deep-well pump	100-hp.	Fairbanks-Morse	Direct
Return conveyor feeder	Driven from return conveyor tail pulley.		

More Producers Express Opinions of New Fair Labor Standards Act

With the effective date of "The Fair Labor Standards Act of 1938" less than one month away employers in all lines of industry are becoming increasingly concerned about the possible effects of its enforcement on their businesses. Responding to an invitation from PIT AND QUARRY'S Directing Editor, both large and small producers in the nonmetallic-mineral industries have freely expressed their views on the law's adequacy and practicability and the difficulties that may be expected to follow its application.

Merely as suggested topics for discussion the following questions were asked:

1. Do you think the 25c an hr. minimum is too high or too low?

2. Do you think the 44-hr. week is too short or too long?

3. How will they affect your company, if at all?

4. Do you think these wage-and-hour restrictions should be applied to employers who are actually engaged in interstate commerce and not to their competitors who may sell only within their home state? In other words, do you think the applicability of the law's provisions to any given employer should be determined by the nature of his business (interstate or intrastate), or should this determination be made for an entire industry?

5. Do you think that exemptions from the minimum-wage provisions should be made in favor of certain geographical areas, because of low-wage standards prevailing there, lower living costs, or for other reasons?

6. Do you think that this law—assuming strict enforcement and a reasonably high percentage of compliance—will raise the income and purchasing power of workers who are now paid less than the law's minimum?

7. Do you believe that the operation of this law will improve employer-employee relations by (for example) weakening the hold of labor unions on their members, or making workers less discontented with their economic position, or narrowing the range within which hours and wages can be the subjects of labor disputes, etc.?

8. What, if any, actual practical difficulties do you expect to encounter as results of this law's enforcement?

Some of the replies were published last month; others are published on these pages; still others will appear in the November number. To enable the writers to express themselves without restraint they have been promised anonymity in the publication of their opinions.—DIRECTING EDITOR.

THE writer has read the new wage-and-hour law several times but has not studied it thoroughly, nor has he had the opportunity to get any legal opinion on the matter. In the first place I think it leaves a great deal to interpretation, and the Wagner act and the National Labor Relations Board have proved to all of us that the government has put an entirely different interpretation on these acts than the public, attorneys or judges.

As the minimum wage out in this country is 40 c. per hr., a 25 c. per hr. rate does not affect us.

I do not think a 44-hr. week is too long or too short, provided one can get production out of his men to hold his plant up in the first place. The only place I see that this would affect us in our plant would be in our kiln production, where we have more men on the firing floor to take care of the kilns as they operate 24 hr. per day. We have found this true with the 48-hr. week. Formerly we paid our kiln firemen more wages and they stood 12-hr. shifts, which meant that two kilns had only two firemen on duty over the 24 hr. There was a rest period of 15 to 20 min. in each hour so that although a fireman got paid for a 12-hr. shift he actually worked only 8 or 9 hr. The 44-hr. week necessitated three firemen on each 24 hr., which threw the kilns just one-third off in comparison with the two men.

I think as long as we have such a law it should affect all industry, whether it is interstate or intrastate.

I think the minimum-wage provision should be subject to exemptions in favor of certain geographical areas because of lower living costs.

I do not believe that it will raise the purchasing power of workers nor will it raise the income of the workers.

I do not believe it will improve conditions between employer and employees. I think it will strengthen the labor unions rather than weaken them and their members. I think it will make workers more discontented with their economic condition and I think it will tend to cause more labor disputes.

I expect to find several differences with labor when this law is in force. First, labor had the idea that the president and all the government was going to force the employers to do certain things for the employees. The employees at the present time look at the employer as an ogre who absolutely lives off the sweat of their brows. He has been told this, therefore it must be true. He sees this wage-and-hour act as a great club in his hand to force the employer to do certain things. This will lead to more trouble between the employer and employee. I believe any legislation put through at this time and in this way will tend to make more strife and more labor trouble than we have ever seen before. You must remember that a great many employees, even though they belong to a union, do not agree or do not want to follow all the rules laid down by said union; however, they are coerced and forced into joining the union by threats

THE COMPLETE TEXT OF THE WAGES-AND-HOURS LAW

AN ACT TO PROVIDE FOR THE ESTABLISHMENT OF FAIR LABOR STANDARDS IN EMPLOYMENTS IN AND AFFECTING INTERSTATE COMMERCE, AND FOR OTHER PURPOSES.

SEC. 1. *Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,* That this Act may be cited as the "Fair Labor Standards Act of 1938."

FINDING AND DECLARATION OF POLICY

SEC. 2. (a) The Congress hereby finds that the existence, in industries engaged in commerce or in the production of goods for commerce, of labor conditions detrimental to the maintenance of the minimum standard of living necessary for health, efficiency, and general well-being of workers (1) causes commerce and the channels and instrumentalities of commerce to be used to spread and perpetuate such labor conditions among the workers of the several states; (2) burdens commerce and the free flow of goods in commerce; (3) constitutes an unfair method of competition in commerce; (4) leads to labor disputes burdening and obstructing commerce and the free flow of goods in commerce; and (5) interferes with the orderly and fair marketing of goods in commerce.

(b) It is hereby declared to be the policy of this act, through the exercise by Congress of its power to regulate commerce among the several states, to correct and as rapidly as practicable to eliminate the conditions above referred to in such industries without substantially curtailing employment or earning power.

DEFINITIONS

SEC. 3. As used in this act—

(a) "Person" means an individual, partnership, association, corporation, business trust, legal representative, or any organized group of persons.

(b) "Commerce" means trade, commerce, transportation, transmission, or communication among the several states or from any state to any place outside thereof.

of different kinds and merely join to hold their jobs. This gives the men who do not want to work and the agitators just something more to talk about which the latter certainly will use as a weapon to browbeat these employed members who are law-abiding and who really want to work.

(Lime—Washington)

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THE 25 c. an hr. minimum will have no effect on us, or our competitors. We would have preferred that the minimum wage be established by the industry and the government by regions. There is nothing in the law to put producers on a wage parity.

An inflexible, rigid 44-hr. week (without overtime penalty provisions) does not fit our operating conditions. Our business is extremely seasonal, because most of our customers take in their winter requirements before the first of December. Over a year we will normally average much less than 44 hr. a week of plant operation, but during the peak period of our customers' inventory accumulation we are normally compelled to operate the plant in excess of 50 hr. a week. These periods are only of several months duration and the overtime penalty can be avoided by putting on another shift temporarily, which has the effect of reducing the available employment for our regular crews. To avoid this and to further comply with the law we will doubtless further mechanize and increase hourly production rates, which, from a labor standpoint, will have the net effect of reducing the total hours and employment. As a result, the law will defeat its presumed purpose and reduce purchasing power, and in the end, in our opinion, make for greater discontent.

(Industrial sand—Ohio)

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IF we are to have a legal minimum wage we think the 25 c. an hr. law is as good as anything. It will not affect our company, however. We think 44 hr. are too short a week to enable the men to do well by themselves. Its enforcement will cause quite a readjustment, unless more time is allowed during the peak of the season on account of peculiarities of seasonal operations.

Due to the fact that the small local producer fixes prices in his territory for all aggregates, I believe it must apply to all.

I think 25 c. per hr. is low enough, regardless of location or other factors.

If the law were properly enforced there would be some improvement in the workers' purchasing power. However, there will be a lot of chiselers just as in the N.R.A. The law will not improve the relations between employers and workers because one can not reduce the total weekly wages of a worker and then expect him to think more of the man who employs him, even if it is in compliance with the law.

We expect no trouble except from the Federal employee who thinks that he knows more about our business than we do.

(Crushed stone—Tennessee)

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WE consider the minimum-wage provision of the law satisfactory inasmuch as it will not affect us. The length of the working week should probably be 48 hr., but will not be affected by this regulation either. It is my belief that the law should apply or not apply to an entire industry, regardless of state lines or the nature of shipments made as to state lines.

Exemptions from the minimum-wage provision should be necessary in certain areas. For instance, certain areas and certain classes of labor under the wage set can not be expected to work over two or three days a week, as that will be all the money they want. I have in mind Negroes and Mexicans, and even whites in certain areas, whose need for cash is very low, and who will not work any more than they must. The minimum wage will make some of them rich after three days' work, and no more work can be expected of them until the sum of money earned has been fully dissipated.

(c) "State" means any state of the United States or the District of Columbia or any territory or possession of the United States.

(d) "Employer" includes any person acting directly or indirectly in the interest of an employer in relation to an employee but shall not include the United States or any state or political subdivision of a state, or any labor organization (other than when acting as an employer), or anyone acting in the capacity of officer or agent of such labor organization.

(e) "Employee" includes any individual employed by an employer.

(f) "Agriculture" includes farming in all its branches and among other things includes the cultivation and tillage of the soil, dairying, the production, cultivation, growing and harvesting of any agricultural or horticultural commodities (including commodities defined as agricultural commodities in Sec. 15 (g) of the Agricultural Marketing Act, as amended), the raising of livestock, bees, fur-bearing animals, or poultry, and any practices (including any forestry or lumbering operations) performed by a farmer or on a farm as an incident to or in conjunction with such farming operations, including preparation for market, delivery to storage or to market or to carriers for transportation to market.

(g) "Employ" includes to suffer or permit to work.

(h) "Industry" means a trade, business, industry, or branch thereof, or group of industries, in which individuals are gainfully employed.

(i) "Goods" means goods (including ships and marine equipment), wares, products, commodities, merchandise, or articles or subjects of commerce of any character, or any part or ingredient thereof, but does not include goods after their delivery into the actual physical possession of the ultimate consumer thereof other than a producer, manufacturer, or processor thereof.

(j) "Produced" means produced, manufactured, mined, handled, or in any other manner worked on in any state; and for the purposes of this act an employee shall be deemed to have been engaged in the production of goods if such employee was employed in producing, manufacturing, mining, handling, transporting, or in any other manner working on such goods, or in any process or occupation necessary to the production thereof, in any state.

(k) "Sale" or "sell" includes any sale, exchange, contract to sell, consignment for sale, shipment for sale, or other disposition.

(l) "Oppressive child labor" means a condition of employment under which (1) any employee under the age of 16 years is employed by an employer (other than a parent or a person standing in place of a parent employing his own child or a child in his custody under the age of 16 years in an occupation other than manufacturing or mining) in any occupation, or (2) any employee between the ages of 16 and 18 years is employed by an employer in any occupation which the Chief of the Children's Bureau in the Department of Labor shall find and by order declare to be particularly hazardous for the employment of children between such ages or detrimental to their health or well-being; but oppressive child labor shall not be deemed to exist by virtue of the employment in any occupation of any person with respect to whom the employer shall have on file an unexpired certificate issued and held pursuant to regulations of the Chief of the Children's Bureau certifying that such person is above the oppressive child-labor age. The Chief of the Children's Bureau shall provide by regulation or by order that the employment of employees between the ages of 14 and 16 years in occupations other than manufacturing and mining shall not be deemed to constitute oppressive child labor if and to the extent that the Chief of the Children's Bureau determines that such employment is confined to periods which will not interfere with their schooling and to conditions which will not interfere with their health and well-being.

(m) "Wage" paid to any employee includes the reasonable cost, as determined by the Administrator, to the employer of furnishing such employee with board, lodging, or other facilities, if such board, lodging, or other facilities are customarily furnished by such employer to his employees.

ADMINISTRATOR

SEC. 4. (a) There is hereby created in the Department of Labor a Wage and Hour Division which shall be under the direction of an Administrator, to be known as the Administrator of the Wage and Hour Division (in this act referred to as the "Administrator"). The Administrator shall be appointed by the President, by and with the advice and consent of the Senate, and shall receive compensation at the rate of $10,000 a year.

(b) The Administrator may, subject to the civil-service laws, appoint such employees as he deems necessary to carry out his functions and duties under this act and shall fix their compensation in accordance with the Classification Act of 1923, as amended. The Administrator may establish and utilize such regional, local, or other agencies, and utilize such voluntary and uncompensated services, as may from time to time be needed. Attorneys appointed under this section may appear for and represent the Administrator in any litigation, but all such litigation shall be subject to

I do believe that purchasing power will be increased by the operation of the law, and it is possible that employer-employee relations will be improved. The principal difficulties will be in attempting to take care of the peak demand for short periods of time, due to the lack of trained men.

(Sand and gravel—Texas)

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I BELIEVE the 25 c. an hr. minimum is about right, particularly if it is to include areas outside the metropolitan centers. For our district it is low, but out in the unpopulated sections, it would be about right. It will also permit employment of workers who are partially incapacitated and would not be able to earn more than 25 c. an hr. It will not affect our company at all, as we now have only a 55 c. minimum.

We believe the 44-hr. week should be extended to at least 48 hr. for our industry, because of the seasonal characteristics, and, better yet, a 60-hr. week would be preferable to take care of any peak loads of 10 hr. per day for 6 days. A 44-hr. week at times would force us to run overtime and, of course, pay the extra cost. We have found that a double shift in our operation is impracticable and the men do not want it.

I believe that the wage-and-hour restrictions, if made effective, should apply to all industries, particularly all competitive industries and all competitive units in any one industry.

Special treatment of such geographical areas might be more practical to work out at this time, and then gradually elevate those areas to the average of the country as a whole. A sudden change in wage standards might so disturb industry in those sections as to prove fatal to the employment of the many workers in those particular sections. The South is one area I have in mind.

I do not believe that the wage-and-hour law will raise the purchasing power of workers, because of the fact that the results in the rise of prices generally will run ahead in percentage of the increase in wages to the workers. This has already been proved to be a fact under the N.R.A.

I do believe that the law will make labor unions necessary, if it can be properly policed and enforced. It will give the worker the opinion that he is protected by the government and will not need his own organization for that purpose.

Actual practical difficulties that will arise will be the difficulty on the part of partially disabled persons or older persons who seek employment, because of the fact that they cannot accept lower rates per hour. Industries that are seasonal will also run into practical difficulties, and it would be much better for the worker if the law had a real flexibility.

(Sand and gravel—Missouri)

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WHETHER the 25 c. rate is too low or too high must be determined locally. Our company will not be affected. Neither will the time limitation have an effect on us, as we are now working a 40-hr. week. The law should be uniformly administered for each industry, although it may be necessary to make some exceptions in certain geographical areas. We do not think the law will increase the workers' purchasing power. Whether the relations between employers and employees will be improved will be discovered only when the law is in operation. Difficulties will be found in making proper reports.

(Industrial sand—Ohio)

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THE present 25 c. minimum is too low, but will not affect our company.

The 44-hr. week does not fit the industry at all, and will add a lot to costs.

Regardless of whether the law is applied to individual producers only or to entire industries, to interstate operations or to intrastate operations, the result will be the same in the long run. Ex-

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the direction and control of the Attorney General. In the appointment, selection, classification, and promotion of officers and employees of the Administrator, no political test or qualification shall be permitted or given consideration, but all such appointments and promotions shall be given and made on the basis of merit and efficiency.

(c) The principal office of the Administrator shall be in the District of Columbia, but he or his duly authorized representatives may exercise any or all of his powers in any place.

(d) The Administrator shall submit annually in January a report to the Congress covering his activities for the preceding year and including such information, data, and recommendations for further legislation in connection with the matters covered by this act as he may find advisable.

INDUSTRY COMMITTEES

SEC. 5. (a) The Administrator shall as soon as practicable appoint an industry committee for each industry engaged in commerce or in the production of goods in commerce.

(b) An industry committee shall be appointed by the Administrator without regard to any other provisions of law regarding the appointment and compensation of employees of the United States. It shall include a number of disinterested persons representing the public, one of whom the Administrator shall designate as chairman, a like number of persons representing employees in the industry, and a like number representing employers in the industry. In the appointment of the persons representing each group, the Administrator shall give due regard to the geographical regions in which the industry is carried on.

(c) Two-thirds of the members of an industry committee shall constitute a quorum, and the decision of the committee shall require a vote of not less than a majority of all its members. Members of an industry committee shall receive as compensation for their services a reasonable *per diem*, which the Administrator shall by rules and regulations prescribe, for each day actually spent in the work of the committee, and shall in addition be reimbursed for their necessary traveling and other expenses. The Administrator shall furnish the committee with adequate legal, stenographic, clerical, and other assistance, and shall by rules and regulations prescribe the procedure to be followed by the committee.

(d) The Administrator shall submit to an industry committee from time to time such data as he may have available on the matters referred to it, and shall cause to be brought before it in connection with such matters any witnesses whom he deems material. An industry committee may summon other witnesses or call upon the Administrator to furnish additional information to aid it in its deliberations.

MINIMUM WAGES

SEC. 6. (a) Every employer shall pay to each of his employees who is engaged in commerce or in the production of goods for commerce wages at the following rates:

(1) during the first year from the effective date of this section, not less than 25 c. an hr.,

(2) during the next 6 years from such date, not less than 30 c. an hr.,

(3) after the expiration of 7 years from such date, not less than 40 c. an hr., or the rate (not less than 30 c. an hr.) prescribed in the applicable order of the Administrator issued under Sec. 8, whichever is lower, and

(4) at any time after the effective date of this section, not less than the rate (not in excess of 40 c. an hr.) prescribed in the applicable order of the Administrator issued under Sec. 8.

(b) This section shall take effect upon the expiration of 120 days [1] from the date of enactment of this act.

MAXIMUM HOURS

SEC. 7. (a) No employer shall, except as otherwise provided in this section, employ any of his employees who is engaged in commerce or in the production of goods for commerce—

(1) for a workweek longer than 44 hr. during the first year from the effective date of this section,

(2) for a workweek longer than 42 hr. during the second year from such date, or

(3) for a workweek longer than 40 hr. after the expiration of the second year from such date,

unless such employee receives compensation for his employment in excess of the hours above specified at a rate not less than one and one-half times the regular rate.

(b) No employer shall be deemed to have violated subsection (a) by employing any employee for a workweek in excess of that specified in such subsection without paying the compensation for overtime employment prescribed therein if such employee is so employed—

(1) in pursuance of an agreement, made as a result of collective bargaining by representatives of employees certified as *bona fide* by the National Labor Relations Board, which provides that no employee shall be employed more than 1,000 hr. during any period of 26 consecutive weeks.

(2) on an annual basis in pursuance of an agreement with his employer, made as a result of collective bargaining by representatives of employees certified as bona fide by the National Labor Relations Board, which provides that the employee shall not be employed more than 2,000 hr. during any period of 52 consecutive weeks, or

[1] October 24, 1938.—ED.

emptions should be made from the minimum-wage provisions.

Why assume that the law will be strictly enforced, and that there will be a reasonably-high percentage of compliance? The little fellows will all crawl through the net.

The law just adds government overtime to union wage scales way above 40 c.

We do not expect to encounter any difficulties except added costs and reduced tonnage, and then reduced numbers of workers on the pay-roll.

(Crushed stone—Illinois)

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I THINK the 25 c. minimum is in line, as we are now paying 30 c.

The weekly hour limit should be for 48 rather than 40 hr. However, it will affect our company very little.

All the law's provisions should be applicable to an entire industry, and there should be some exceptions in favor of geographical areas. I do not think the law will help the purchasing power of workers, nor do I believe it will help employer-employee relations, for more disputes will arise than under present conditions.

We don't expect to encounter any difficulties under the new law.

(Sand and gravel—Tennessee)

THE minimum wage of 25 c. per hr. is, in the writer's opinion, too low and does not approximate the present prevailing minimum wage in the industry. It will not affect this corporation.

In the writer's opinion, the 44-hr. week is too short for operations located in the northern states where construction activities are necessarily limited to the summer months. In order to provide a reasonable annual wage, we have found it necessary to give our employees at least 52 hr. per week during the peak operating period and in certain instances upon the insistence of our employees we have allowed them to work 60 hr. per week for a limited period of time. It would appear that our industry should be permitted to average the hours over a representative operating period rather than limit the hours to so many per week.

The limitation of hours to 44 per week will result in the payment of overtime for the excess hours unless the business justified operating on a two-shift basis. It seems that with the available business in sight the average established plant could take care of the normal demand in a workweek varying from 48 to 60 hr. This situation, of course, will not permit operating on a two-shift basis.

Granting the doubtful conclusion that the wage-and-hour law is economically and socially desirable, then its provisions should be applied industry-wide rather than to individual employers whose operations may be said to affect interstate commerce.

Inasmuch as the primary purpose of the wage-and-hour bill is to increase the purchasing power of the great mass of people and thereby raise the standard of living, it seems to the writer that in the determination of minimum wages consideration should be given to variations in living costs as influenced by different geographical locations. On the contrary, if the purpose of the bill is to be realized, then the members of our industry should not desire to perpetuate low-wage standards of various sections of the country when the employees of those sections manifestly live under substandard conditions.

The immediate effect of strict enforcement of the act would probably be that the income and the purchasing power of the workers in our industry will be raised. On the contrary, there will undoubtedly be a marked advancement in mechanical means to eliminate labor. Consequently, the long-range effect of the act may be to lower the aggregate income of the workers in our industry.

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(3) for a period or periods of not more than 14 workweeks in the aggregate in any calendar year in an industry found by the Administrator to be of a seasonal nature,

and if such employee receives compensation for employment in excess of 12 hr. in any workday, or for employment in excess of 56 hr. in any workweek, as the case may be, at a rate not less than one and one-half times the regular rate at which he is employed.

(c) In the case of an employer engaged in the first processing of milk, whey, skimmed milk, or cream into dairy products, or in the ginning and compressing of cotton; or in the processing of cottonseed, or in the processing of sugar beets, sugar-beet molasses, sugar cane, or maple sap, into sugar (but not refined sugar) or into syrup, the provisions of subsection (a) shall not apply to his employees in any place of employment where he is so engaged; and in the case of an employer engaged in the first processing of, or in canning or packing, perishable or seasonal fresh fruits or vegetables, or in the first processing, within the area of production (as defined by the Administrator), of any agricultural or horticultural commodity during seasonal operations, or in handling, slaughtering, or dressing poultry or livestock, the provisions of subsection (a), during a period or periods of not more than 14 workweeks in the aggregate in any calendar year, shall not apply to his employees in any place of employment where he is so engaged.

(d) This section shall take effect upon the expiration of 120 days [1] from the date of enactment of this act.

WAGE ORDERS

SEC. 8. (a) With a view to carrying out the policy of this act by reaching, as rapidly as is economically feasible without substantially curtailing employment, the objective of a universal minimum wage of 40 c. an hr. in each industry engaged in commerce or in the production of goods for commerce, the Administrator shall from time to time convene the industry committee for each such industry, and the industry committee shall from time to time recommend the minimum rate or rates of wages to be paid under Sec. 6 by employers engaged in commerce or in the production of goods for commerce in such industry or classifications therein.

(b) Upon the convening of an industry committee, the Administrator shall refer to it the question of the minimum wage rate or rates to be fixed for such industry. The industry committee shall investigate conditions in the industry and the committee, or any authorized subcommittee thereof, may hear such witnesses and receive such evidence as may be necessary or appropriate to enable the committee to perform its duties and functions under this act. The committee shall recommend to the Administrator the highest minimum wage rates for the industry which it determines, having due regard to economic and competitive conditions, will not substantially curtail employment in the industry.

(c) The industry committee for any industry, shall recommend such reasonable classifications within any industry as it determines to be necessary for the purpose of fixing for each classification within such industry the highest minimum wage rate (not in excess of 40 c. an hr.) which (1) will not substantially curtail employment in such classification and (2) will not give a competitive advantage to any group in the industry, and shall recommend for each classification in the industry the highest minimum wage rate which the committee determines will not substantially curtail employment in such classification. In determining whether such classifications should be made in any industry, in making such classifications, and in determining the minimum wage rates for such classifications, no classification shall be made, and no minimum wage rate shall be fixed, solely on a regional basis, but the industry committee and the Administrator shall consider among other relevant factors the following:

(1) competitive conditions as affected by transportation, living, and production costs;

(2) the wages established for work of like or comparable character by collective labor agreements negotiated between employers and employees by representatives of their own choosing; and

(3) the wages paid for work of like or comparable character by employers who voluntarily maintain minimum-wage standards in the industry. No classification shall be made under this section on the basis of age or sex.

(d) The industry committee shall file with the Administrator a report containing its recommendations with respect to the matters referred to it. Upon the filing of such report, the Administrator, after due notice to interested persons, and giving them an opportunity to be heard, shall by order approve and carry into effect the recommendations contained in such report, if he finds that the recommendations are made in accordance with law, are supported by the evidence adduced at the hearing, and, taking into consideration the same factors as are required to be considered by the industry committee, will carry out the purposes of this section; otherwise he shall disapprove such recommendations. If the Administrator disapproves such recommendations, he shall again refer the matter to such committee, or to another industry committee for such industry (which he may appoint for such purpose), for further consideration and recommendations.

(e) No order issued under this section with respect to any industry prior to the expiration

The writer personally does not believe that the act will improve employer-employee relationship, nor will it in any way supersede the promotional efforts of the trade union. In the writer's opinion, the enforcement of the act will tend to stimulate the unionization of the sand and gravel industry.

Any effort to strait-jacket industry produces a number of vexing problems. Hourly limitations will undoubtedly prove very serious for employers in the northern states because it will make it impossible to maintain a flexible operating condition and at the same time it will so decrease the annual income of the employees that they will become very much dissatisfied. Obviously, the sponsors of the act anticipated this difficulty and had in mind that the hourly rates must necessarily be very substantially increased in order to maintain employee harmony. With most plants operating at about 40% of capacity, it seems evident that an increase in the rates of pay will very seriously threaten the continuation of a great number of sizable operations. Moreover, the application of the provisions of the act will probably aggravate employer-employee relationship by encouraging the filing of innumerable complaints by disgruntled employees. Each complaint must necessarily be answered and in all probability a formal hearing will be held. This time-consuming procedure is not only annoying but it distracts management from its real functions. The best answer to your ninth question is to be found in the experience of the industry with the Code of Fair Competition adopted in the National Recovery Administration days. There existed some flexibility under that code and it was ostensibly administered by the industry itself. Add to the shortcomings of that set up a rigid and inelastic law administered by a slow-moving and political-minded bureaucracy and you will have some conception of what awaits our industry.

(Sand and gravel—Ohio)

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UNDER present business conditions, we think that the 25 c. an hr. minimum is a fair rate of compensation. It will not affect our company at present, as we are paying more than this figure.

The 44-hr. week, we believe, should be made flexible on account of our business being seasonal, and an annual production must be got out in nine months or less of each year with practically no work during the three winter months. For this reason, the crushed-stone industry should have a right to work longer hours during exceptionally busy seasons.

It is our opinion that the wage and hour restrictions should be applied to the crushed-stone business as an industry and not limited to those actually doing interstate business; otherwise, those doing interstate business will be placed at a great disadvantage when in competition intrastate with shippers who do not come under the wage-and-hour law provisions.

We think the minimum-wage provisions should take into consideration geographical areas where lower living costs are possible.

It is our opinion that a strict enforcement of this law will not raise the income or purchasing power of workers to any appreciable extent since it will not create any additional business, but, on the other hand, will reduce the possible earning power of individuals.

We do not believe that the operation of this law will improve employer-employee relations, nor will it weaken the hold of labor unions on their members.

We expect to encounter great difficulties in securing sufficient man power to operate our quarries and crushing plants during the peak season, during which we frequently operate from 12 to 24 hr. daily. It will work hardships on our men while we are unable to give them employment during the winter months.

(Lime—Virginia)

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of seven years from the effective date of Sec. 6 shall remain in effect after such expiration, and no order shall be issued under this section with respect to any industry on or after such expiration, unless the industry committee by a preponderance of the evidence before it recommends, and the Administrator by a preponderance of the evidence adduced at the hearing finds, that the continued effectiveness or the issuance of the order, as the case may be, is necessary in order to prevent substantial curtailment of employment in the industry.

(f) Orders issued under this section shall define the industries and classifications therein to which they are to apply, and shall contain such terms and conditions as the Administrator finds necessary to carry out the purposes of such orders, to prevent the circumvention or evasion thereof, and to safeguard the minimum wage rates established therein. No such order shall take effect until after due notice is given of the issuance thereof by publication in the Federal Register and by such other means as the Administrator deems reasonably calculated to give to interested persons general notice of such issuance.

(g) Due notice of any hearing provided for in this section shall be given by publication in the Federal Register and by such other means as the Administrator deems reasonably calculated to give notice to interested persons.

ATTENDANCE OF WITNESSES

SEC. 9. For the purpose of any hearing or investigation provided for in this Act, the provisions of Sec. 9 and 10 (relating to the attendance of witnesses and the production of books, papers, and documents) of the Federal Trade Commission Act of September 16, 1914, as amended (U.S.C., 1934 edition, Title 15, Sec. 49 and 50), are hereby made applicable to the jurisdiction, powers, and duties of the Administrator, the Chief of the Children's Bureau, and the industry committees.

COURT REVIEW

SEC. 10. (a) Any person aggrieved by an order of the Administrator issued under Sec. 8 may obtain a review of such order in the circuit court of appeals of the United States for any circuit wherein such person resides or has his principal place of business, or in the United States Court of Appeals for the District of Columbia, by filing in such court, within 60 days after the entry of such order, a written petition praying that the order of the Administrator be modified or set aside in whole or in part. A copy of such petition shall forthwith be served upon the Administrator, and thereupon the Administrator shall certify and file in the court a transcript of the record upon which the order complained of was entered. Upon the filing of such transcript such court shall have exclusive jurisdiction to affirm, modify, or set aside such order in whole or in part, so far as it is applicable to the petitioner. The review by the court shall be limited to questions of law, and findings of fact by the Administrator when supported by substantial evidence shall be conclusive. No objection to the order of the Administrator shall be considered by the court unless such objection shall have been urged before the Administrator or unless there were reasonable grounds for failure so to do. If application is made to the court for leave to adduce additional evidence, and it is shown to the satisfaction of the court that such additional evidence may materially affect the result of the proceeding and that there were reasonable grounds for failure to adduce such evidence in the proceeding before the Administrator, the court may order such additional evidence to be taken before the Administrator and to be adduced upon the hearing in such manner and upon such terms and conditions as to the court may seem proper. The Administrator may modify his findings by reason of the additional evidence so taken, and shall file with the court such modified or new findings which if supported by substantial evidence shall be conclusive, and shall also file his recommendation, if any, for the modification or setting aside of the original order. The judgment and decree of the court shall be final, subject to review by the Supreme Court of the United States upon certiorari or certification as provided in Sec. 239 and 240 of the Judicial Code, as amended (U.S.C., Title 28, Sec. 346 and 347).

(b) The commencement of proceedings under subsection (a) shall not, unless specifically ordered by the court, operate as a stay of the Administrator's order. The court shall not grant any stay of the order unless the person complaining of such order shall file in court an undertaking with a surety or sureties satisfactory to the court for the payment to the employees affected by the order, in the event such order is affirmed, of the amount by which the compensation such employees are entitled to receive under the order exceeds the compensation they actually receive while such stay is in effect.

INVESTIGATIONS, INSPECTIONS, AND RECORDS

SEC. 11. (a) The Administrator or his designated representatives may investigate and gather data regarding the wages, hours, and other conditions and practices of employment in any industry subject to this act, and may enter and inspect such places and such records (and make such transcriptions thereof), question such employees, and investigate such facts, conditions, practices, or matters as he may deem necessary or appropriate to determine whether any person has violated any provision of this act, or which may aid in the enforcement of the provisions of this act. Except as provided in Sec. 12 and in subsection (b) of this section, the Administrator shall utilize the bureaus and divisions of the Department of

Labor for all the investigations and inspections necessary under this section. Except as provided in Sec. 12, the Administrator shall bring all actions under Sec. 17 to restrain violations of this act.

(b) With the consent and coöperation of state agencies charged with the administration of state labor laws, the Administrator and the Chief of the Children's Bureau may, for the purpose of carrying out their respective functions and duties under this act, utilize the services of state and local agencies and their employees and, notwithstanding any other provision of law, may reimburse such state and local agencies and their employees for services rendered for such purposes.

(c) Every employer subject to any provision of this act or of any order issued under this act shall make, keep, and preserve such records of the persons employed by him and of the wages, hours, and other conditions and practices of employment maintained by him, and shall preserve such records for such periods of time, and shall make such reports therefrom to the Administrator as he shall prescribe by regulation or order as necessary or appropriate for the enforcement of the provisions of this act or the regulations or orders thereunder.

CHILD LABOR PROVISIONS

SEC. 12. (a) After the expiration of 120 days [2] from the date of enactment of this act, no producer, manufacturer, or dealer shall ship or deliver for shipment in commerce any goods produced in an establishment situated in the United States in or about which within 30 days prior to the removal of such goods therefrom any oppressive child labor has been employed: Provided, That a prosecution and conviction of a defendant for the shipment or delivery for shipment of any goods under the conditions herein prohibited shall be a bar to any further prosecution against the same defendant for shipments or deliveries for shipment of any such goods before the beginning of said prosecution.

(b) The Chief of the Children's Bureau in the Department of Labor, or any of his authorized representatives, shall make all investigations and inspections under Sec. 11 (a) with respect to the employment of minors, and, subject to the direction and control of the Attorney General, shall bring all actions under Sec. 17 to enjoin any act or practice which is unlawful by reason of the existence of oppressive child labor, and shall administer all other provisions of this act relating to oppressive child labor.

EXEMPTIONS

SEC. 13. (a) The provisions of Sec. 6 and 7 shall not apply with respect to (1) any employee employed in a *bona fide* executive, administrative, professional, or local retailing capacity, or in the capacity of outside salesman (as such terms are defined and delimited by regulations of the Administrator); or (2) any employee engaged in any retail or service establishment the greater part of whose selling or servicing is in intrastate commerce; or (3) any employee employed as a seaman; or (4) any employee of a carrier by air subject to the provisions of Title II of the Railway Labor Act; or (5) any employee employed in the catching, taking, harvesting, cultivating, or farming of any kind of fish, shellfish, crustacea, sponges, seaweeds or other aquatic forms of animal and vegetable life, including the going to and returning from work and including employment in the loading, unloading, or packing of such products for shipment or in propagating, processing, marketing, freezing, canning, curing, storing or distributing the above products or byproducts thereof; or (6) any employee employed in agriculture; or (7) any employee to the extent that such employee is exempted by regulations or orders of the Administrator issued under Sec. 14; or (8) any employee employed in connection with the publication of any weekly or semi-weekly newspaper with a circulation of less than 3,000, the major part of which circulation is within the county where printed and published; or (9) any employee of a street, suburban, or interurban electric railway, or local trolley or motor bus carrier, not included in other exemptions contained in this section; or (10) to any individual employed within the area of production (as defined by the Administrator), engaged in handling, packing, storing, ginning, compressing, pasteurizing, drying, preparing in their raw or natural state, or canning of agricultural or horticultural commodities for market, or in making cheese or butter or other dairy products.

(b) The provisions of Sec. 7 shall not apply with respect to (1) any employee with respect to whom the Interstate Commerce Commission has power to establish qualifications and maximum hours of service pursuant to the provisions of Sec. 204 of the Motor Carrier Act, 1935; or (2) any employee of an employer subject to the provisions of Part I of the Interstate Commerce Act.

(c) The provisions of Sec. 12 relating to child labor shall not apply with respect to any employee employed in agriculture while not legally required to attend school, or to any child employed as an actor in motion pictures or theatrical productions.

LEARNERS, APPRENTICES, AND HANDICAPPED WORKERS

SEC. 14. The Administrator, to the extent necessary in order to prevent curtailment of opportunities for employment, shall by regulations or by orders provide for (1) the employment of learners, of apprentices, and of messengers employed exclusively in delivering letters and messages, under special certificates issued pursuant to regulations of the Administrator, at such wages lower than the minimum wage applicable under Sec. 6 and subject to such limitations as to time, number, proportion, and length of service as the Administrator shall prescribe, and (2) the employment of individuals whose earning capacity is impaired by age or physical or mental deficiency or injury, under special certificates issued by the Administrator, at such wages lower than the minimum wage applicable under Sec. 6 and for such period as shall be fixed in such certificates.

PROHIBITED ACTS

SEC. 15. (a) After the expiration of 120 days [3] from the date of enactment of this act, it shall be unlawful for any person—

(1) to transport, offer for transportation, ship, deliver, or sell in commerce, or to ship, deliver, or sell with knowledge that shipment or delivery or sale thereof in commerce is intended, any goods in the production of which any employee was employed in violation of Sec. 6 or Sec. 7, or in violation of any regulation or order of the Administrator issued under Sec. 14; except that no provision of this act shall impose any liability upon any common carrier for the transportation in commerce in the regular course of its business of any goods not produced by such common carrier, and no provision of this act shall excuse any common carrier from its obligation to accept any goods for transportation;

(2) to violate any of the provisions of Sec. 6 or Sec. 7, or any of the provisions of any regulation or order of the Administrator issued under Sec. 14;

(3) to discharge or in any other manner discriminate against any employee because such employee has filed any complaint or instituted or caused to be instituted any proceeding under or related to this act, or has testified or is about to testify in any such proceeding, or has served or is about to serve on an industry committee;

(4) to violate any of the provisions of Sec. 12;

(5) to violate any of the provisions of Sec. 11 (c), or to make any statement, report, or record filed or kept pursuant to the provisions of such section or of any regulation or order thereunder, knowing such statement, report, or record to be false in a material respect.

(b) For the purposes of subsection (a) (1) proof that any employee was employed in any place of employment where goods shipped or sold in commerce were produced, within 90 days prior to the removal of the goods from such place of employment, shall be prima facie evidence that such employee was engaged in the production of such goods.

PENALTIES

SEC. 16. (a) Any person who wilfully violates any of the provisions of Sec. 15 shall upon conviction thereof be subject to a fine of not more than $10,000, or to imprisonment for not more than 6 months, or both. No person shall be imprisoned under this subsection except for an offense committed after the conviction of such person for a prior offense under this subsection.

(b) Any employer who violates the provisions of Sec. 6 or Sec. 7 of this act shall be liable to the employee or employees affected in the amount of their unpaid minimum wages, or their unpaid overtime compensation, as the case may be, and in an additional equal amount as liquidated damages. Action to recover such liability may be maintained in any court of competent jurisdiction by any one or more employees for and in behalf of himself or themselves and other employees similarly situated, or such employee or employees may designate an agent or representative to maintain such action for and in behalf of all employees similarly situated. The court in such action shall, in addition to any judgment awarded to the plaintiff or plaintiffs, allow a reasonable attorney's fee to be paid by the defendant, and costs of the action.

INJUNCTION PROCEEDINGS

SEC. 17. The district courts of the United States and the United States courts of the territories and possessions shall have jurisdiction, for cause shown, and subject to the provisions of Sec. 20 (relating to notice to opposite party) of the act entitled "An act to supplement existing laws against unlawful restraints and monopolies, and for other purposes," approved October 15, 1914, as amended (U.S.C., 1934 edition, Title 28, Sec. 381), to restrain violations of Sec. 15.

RELATION TO OTHER LAWS

SEC. 18. No provision of this act or of any order thereunder shall excuse noncompliance with any Federal or state law or municipal ordinance establishing a minimum wage higher than the minimum wage established under this act or a maximum workweek lower than the maximum workweek established under this act, and no provision of this act relating to the employment of child labor shall justify noncompliance with any Federal or state law or municipal ordinance establishing a higher standard than the standard established under this act. No provision of this act shall justify any employer in reducing a wage paid by him which is in excess of the applicable minimum wage under this act, or justify any employer in increasing hours of employment maintained by him which are shorter than the maximum hours applicable under this act.

SEPARABILITY OF PROVISIONS

SEC. 19. If any provision of this act or the application of such provision to any person or circumstance is held invalid, the remainder of the act and the application of such provision to other persons or circumstances shall not be affected thereby.

[2] October 24, 1938.—ED.

[3] October 24, 1938.—ED.

By I. ERSHLER and S. STOLIAROV
Engineers, U. S. S. R.

Extinct Volcano Yields Raw Material for Novospassk Cement Plant

THE Novospassk Portland-cement plant of the U.S.S.R. in the Far East started working in February, 1935. It was designed for operation by the dry process and an annual capacity of 320,000 tons of high-quality clinker. The construction of the factory was divided into two stages, so that all the construction work on the buildings of the plant itself and of the auxiliary shops has been completed—*i.e.*, for the entire eventual capacity of the plant—while the main technological equipment, with the exception of crushing machinery, has been installed only for one-half of its capacity, *i.e.*, for 160,000 tons annually. The project foresees the possibility of a subsequent enlarging of the factory to double capacity. Ten per cent of preliminary dried travertine is added to the clinker before grinding and consequently the total capacity of ground Portland cement is 350,000 tons. Electric power is supplied by the plant's own electric station, of which we shall speak in greater detail later. The factory is connected by a standard-gage branch line about 5 km. long with the Transsiberian trunk-line railway.

Quarries—As raw materials the plant uses limestone and clay.

The limestone quarry is an extinct volcano, standing alone. It rises about 100 m. above the surrounding valley and is composed of very hard limestone of various shades of grey. The limestone is recovered by blasting and subsequent loading into 4-cu.m. cars by means of 1.5-cu.m. one-bucket excavators. Large bowlders are hand-drilled and blasted again. The limestone is taken from the quarry to the plant by Diesel locomotives hauling along a double narrow-gage (750-mm.) track the 4-cu.m. cars already mentioned. The distance from the quarry to the plant is about 500 m.

The average chemical composition of the limestone is as follows:

Loss upon ignition	42.50 per cent.
Silica (SiO_2)	1.21 per cent.
Sesquioxides (Al_2O_3 + Fe_2O_3)	1.15 per cent.
Calcium oxide (CaO)	54.10 per cent.
Magnesium oxide (MgO)	0.38 per cent.
Sulphuric anhydride (SO_3)	0.08 per cent.
Potassium and sodium oxides ($K_2O + Na_2O$)	0.57 per cent.
Total	99.99 per cent.

The natural moisture content of the limestones is from 1 to 2 per cent. and only during the rainy season does it rise to as much as 5 per cent.

The limestone massif is surrounded on every side by a plain of very plastic yellow clay covered by thin turf. The clay quarry has been opened at a small distance (about 200 m.) from the plant. The quarrying is done by a 1-bucket excavator; the bucket's capacity is 0.65 cu.m. Clay is loaded into the ¾-cu.m. cars of a cableway.

The average chemical composition of the clay is as follows:

Weight loss upon ignition	8.08 per cent.
Silica (SiO_2)	61.19 per cent.
Sesquioxides (Al_2O_3 + Fe_2O_3)	26.70 per cent.
Calcium oxide (CaO)	1.47 per cent.
Magnesium oxide (MgO)	0.81 per cent.
Sulphuric anhydride (SO_3)	0.44 per cent.
Potassium and sodium oxides (K_2O : Na_2O)	1.04 per cent.
Total	98.73 per cent.

The natural moisture content of the clays is 15 per cent.; during the rainy season it rises to 20 to 25 per cent.

Both the limestones and the clay have a constant chemical composition. The consumption of raw materials per ton of clinker is:

Dry limestone	1.32 tons
Dry clay	0.37 tons
Total	1.70 tons

If we take into account 5 per cent. lost as dust during the drying in the driers we obtain the following figures:

Raw limestone	1.39 tons
Raw clay	0.496 tons
Total	1.90 tons

(if the moisture content of the limestone is 5 per cent. and that of the clay is 25 per cent.)

The total expenditure of raw material of natural humidity is shown in the following table, the annual number of working days being equal to 300:

	Capacity of Plant (*tons per year*)			
	140,000	280,000	140,000	280,000
Yearly	194,500	389,000	69,500	139,000
Daily*	648	1,296	231	462

*24 hours.

Limestone-Crushing Department. (Works 3 shifts, or 21 hr., daily, and 300 days in the year.)—Limestone brought from the quarry is unloaded into a reinforced-concrete bunker from which, by means of a metal-plate feeder 1,500 mm. wide and 12,000 mm. long, it is transferred for preliminary crushing into a Smidth crusher, with an opening of 1,200 by 900 mm. The capacity of this crusher—the dimensions of the entering lumps not exceeding 800 mm. and those of the lumps leaving not exceeding 200 mm.—is 120 tons per hr. The crusher is driven by a 125-hp., 725-r.p.m. motor by means of a line shaft and belts.

After preliminary crushing in the jaw the limestone is fed to a metallic-plate conveyor 1,200 mm. wide and 17,500 mm. long, which transports it for secondary crushing into the hammer-mill, also made by Smidth. Its diameter is 1,200 mm. and its width is 1,500 mm. and its capacity is 120 tons per hr. The lumps of limestone after crushing must not exceed 20 to 30 mm. in size. This mill is driven by a 240-hp., 725-r.p.m. motor directly through a clutch. An exhauster fan is installed to eliminate dust in the crushing department. Its capacity is 10,370 cu.m. per hr. at a pressure of 30 mm. water column. It draws the dusty air after the hammer-mill.

The crushed limestone is taken from the hammer-mill by an inclined, grooved rubber-belt conveyor 750 mm. wide and 6,346 mm. long, installed in a special gallery connecting the crushing and the drying departments, and further on by a system of horizontal belt-conveyors is directed either to the drying department or to the raw-material storage.

Clay-Crushing Department. (Works 3 shifts, or 21 hr., daily and 300 days in the year.)—Clay from the quarry passing through a reinforced-concrete bunker is carried on a metallic-plate feeder 800 mm. wide and 6,000 mm. long, which feeds it into a Smidth toothed-roll crusher, 1,000 by 1,000 mm. The capacity of this roll-crusher is 35 tons per hr., the dimensions of the crushed material being 20 to 30 mm. The machine is driven by a 50-hp., 725-r.p.m. motor through a line shaft. The crushed clay is brought into the drying

department by means of an inclined grooved rubber-belt conveyor, 750 mm. wide and 84,140 mm. long, passing through a special gallery connecting the crushing department with the drying department.

Raw-Material Storage.—In view of eventual long shut-down periods of the crushing department as well as of irregular work of the quarries due to rainy weather or snowstorms, a reserve stock of raw materials, directly adjoining the drying department, has been provided. The dimensions of this storage allow a 5-day stock of raw crushed limestone and dried clay (which enters the storage from the drying department) to be accumulated. The raw-material storage is equipped with a Babcock & Wilcox traveling crane with an 18 m. span and a bucket of 3-cu.m. capacity. The load can be lifted at a rate of 40 m. per min. The buckets' rate of travel is at 65 m. per min. and that of the crane 150 m. per min.

Raw-Material Drying Department. (Works 3 shifts, or 24 hr. daily, and 300 days in the year.)—The two limestone driers needed for the plant's full capacity are already installed. They are of Soviet make, 2.2 by 18 m. in size and of the open type—*i.e.,* without brick setting—working on the counter-flow principle. The volume of the drying space of each unit is 68.4 cu.m. The performance of the drying space at a 5-per cent. initial and 0-per cent. final moisture of limestone had been estimated by the designers as 19.8 kg. of water per cu. m. as against the 30 kg. per cu. m. guaranteed by the makers.

A reinforced-concrete bunker with a capacity of 75 tons has been installed in front of each of the driers. From this bunker raw limestone is fed into the drier by a 2,000-mm. plate feeder. One of the limestone driers may in case of necessity be used for drying clay.

Of the 4 driers designed for the drying of clay—3 working and 1 stand-by —two are already installed. They are of the same type and size as those used for limestone. The performance of the drying space at an initial moisture content of clay of 25 per cent. and at a final one of 0.5 per cent. has been estimated by the designers at 23 kg. per cu. m. Each drier is equipped with a reinforced-concrete bunker with a capacity of 15 cu. m., from which raw clay is fed into the drier by a plate feeder, 2,000 mm. in diameter.

The dried material is transferred from the driers by two independent metallic conveyors of which the one for limestone is 800 mm. wide and 14,000 mm. long and the other for clay is 400 mm. wide and 36,000 mm. long —to three elevators 450 mm. high. One of these elevators transports limestone, the second clay, and the third is a stand-by unit and may be used for either material. The dry limestone and clay raised by the elevators are transported further into the bunkers of the raw mills—the first by a "torpedo" (h-800 mm.) and the second by a 400-mm. screw-conveyor. From the latter dry clay may be let out to storage through a special chute.

The heating of the driers is done by means of pulverized-coal furnaces, one furnace serving two driers simultaneously. The furnaces are equipped with pulverized-coal burners made by Piebody ($\varnothing = 105$ mm.). The primary air for feeding the finely-powdered coal is provided by a fan with a capacity of 4.230 cu. m. per hr. at a pressure of 200 mm. water column. The secondary air is blown into the furnace by a fan with a capacity of 21,380 cu. m. per hr. at a pressure of 50 mm. water column. Each furnace is equipped with one fan for the primary air and one for the secondary air. In the design of these furnaces the specific heat consumption for the drying of limestone has been estimated as 1,925 calories per kg. of water, and for the drying of clay as 1,350 calories.

Pulverized coal for the heating of the driers is delivered by a Fuller-Kinyon pump from the central coal-preparing department which will be described later. The dust is removed from the driers by means of metallic chamber filters placed in reinforced-concrete dust chambers. The dust collecting in these chambers is transported by a system of screw-feeders to the metallic conveyor for limestone or clay respectively and further, together with these, to the bunkers of the raw mills. Each drier has its own chamber filter with a fan of 20,312-cu. m. per hr. capacity at a pressure of 100 mm. water column. When maintenance work or cleaning of the filter is in progress the filter can be by-passed and the discharge make directly into the stack.

Raw-Materials Grinding Department. (Works 3 shifts, or 21 hr. daily, and 300 days in the year.)—The first stage of construction included the installment of two 4-compartment mills, 2.2 by 12 m., made by Smidth. The guaranteed output of each mill is 24 tons per hr.; at a fineness of 90 per cent. through a sieve of 70 meshes per cu. sq. m. (4,900 per sq. cm.), the size of lumps fed for grinding not exceeding 20 to 30 mm. Before each mill are installed two reinforced-concrete bunkers: one for limestone with a capacity of 125 tons, the other for clay with an 80-ton capacity. Each mill is equipped with two Smidth dish-plate feeders, one ($\varnothing = 2{,}000$ mm.) for limestone and the second ($\varnothing = 1{,}300$ mm.) for clay. The grinding-medium charge of each mill is 48 tons, of which 26.5 tons comprise steel balls with diameters ranging from 30 to 90 mm., and 21.5 tons "steel pebbles" with diameters from 13 to 19 mm. Each mill is provided with an 800-hp. motor working at 730 r.p.m. and coupled to it through a Wuelel speed reducer. The mills are served by two overhead traveling cranes, each with hand-operated lifting gear—one 6-ton crane at the discharge end of the mill and one 3-ton crane at the charging end. The motor compartment is also equipped with a 6-ton hand-operated overhead traveling crane.

The second stage of installation work comprises two 3-compartment mills 2.2 by 13 m., made in the U.S.S.R., with a capacity of 26 tons per hr. at a fineness of 90 per cent. through a sieve of 70 meshes per cm. Of the four mills three will be in operation, the fourth is a stand-by unit.

The air from the raw mills is aspired through Beta filters; there are two 32-duct Beta dust filters with automatic dust shakers for each mill. The dust-laden air from the mill is exhausted through the filters by a fan of 16.424-cu. m. per hr. capacity at a pressure of 125 mm. water column. The dust collected in the filters is transferred by a screw-conveyor 130 mm. in diameter to the common screw-conveyor from the mills, 600 mm. in diameter, delivering the raw powder from the mills to the mixing silos department.

Mixing Silos Department.—The raw powder from the mills is delivered by the common mill screw-conveyor, $\varnothing =$ 600 mm., to two elevators 600 mm. wide, one of which is a stand-by unit. From the elevators the powder is fed to two screw-conveyors, $\varnothing = 600$ mm.— one is a stand-by unit—that deliver it to the mixing silos. There are in all 8 mixing silos of reinforced concrete, each 7,700 mm. in diameter and 13,000 mm. high. The capacity of one silo when filled to three-fourths of its volume and at a specific weight of the powder of 1,200 kg. per cu. m., is 677 tons. The total capacity of the 8 silos is 5,414 tons. This means a storage capacity of 3.5 24-hr. days' work at a consumption of 1,575 tons of raw powder per day (280,-000 tons per annum output of the works).

Every silo has two discharge screw-conveyors, $\varnothing = 200$ mm., by which the raw powder from the silos is transported to two longitudinally-arranged screw-conveyors, $\varnothing = 600$ mm., delivering to two Fuller-Kinyon pumps. There are two 10-m. Fuller-Kinyon pumps made by Claudius Peters. The makers guaranteed a 100-ton per hr. capacity for each pump. The pumps are directly connected through couplings to 110-hp., 970-r.p.m. motors. Ahead of the Fuller-Kinyons there is installed a com-

mon receiver of 10-cu. m. capacity. The air to the receiver is delivered through a pipe-line from the central compressor plant of the factory. The mixing silos are operated as follows. Four of the eight silos are filled with correctly-proportioned powder, which by means of a longitudinally-arranged screw-conveyor, $\emptyset = 600$ mm., and a Fuller-Kinyon pump is transported to the bunkers of the rotary kilns. At the same time the remaining four silos are being filled with raw powder from the mills; simultaneously another longitudinal screw-conveyor and a second Fuller-Kinyon pump correct the proportion of the powder and mix it. The delivery lines of the two Fuller-Kinyon pumps are intercorrected to provide for better adjustment to the conditions of working. To eliminate the dust in the powder elevators and from the overhead screw-conveyors on the silos there is a Beta filter with 24 ducts and automatic shakers; an exhausting fan delivers 5,520 cu. m. per hr. at a pressure of 125 mm. water column. The air from the screw-conveyors under the silos is aspired by a fan of 11,520-cu. m. per hr. capacity at a pressure of 50 mm. water column. This fan draws the dust-laden air from the space between the silos, isolated by decks at the top and the bottom, thus forming dust chambers 13 m. high. These are connected by aspiration ducts to screw-conveyors.

The Rotary-Kiln Department. (Works 24 hr. daily and 300 days in a year.)—The building erected has been designed for four kilns. Of these there are installed at present two, 3.0 by 51.2 m., without enlarged sections, with open-type coolers, 2.2 by 23 m. The output of each kiln is 9.6 tons per hr., corresponding to a yearly production of 70,000 tons of clinker. The kilns and coolers have been made in the U.S.S.R. The heat consumption as estimated in the design calculations is 1,900 Hcal. per kg. of clinker, the heat of the waste gases from the kilns being recovered in waste-heat steam boilers.

The kilns are rotated by 75 hp., 750-r.p.m. a.-c. motors, with speed control down to 380 r.p.m. The motors are coupled to the kilns through Wuelfel speed reducers. The coolers are driven by 40-hp., 750-r.p.m. motors, also through Wuelfel reducing gears. Each kiln is provided with a service bunker with a storage capacity for raw powder for 3 hr. operation. The bunker is charged by Fuller-Kinyon pumps and discharged by two screw-feeders, 200 mm. in diameter. The discharge screw-feeders are driven through a belt transmission by 3-hp., 1,000-r.p.m. d.-c. motors with speed control down to 500 r.p.m. Each screw-feeder has a separate motor drive.

The raw powder is delivered by the discharge screw-feeders to a mixing screw-conveyor 800 by 3,300 mm., where it is moistened to an 8 to 10 per cent. moisture content and thoroughly mixed. It is then discharged through a cast-iron chute into the kiln.

The fuel, finely-pulverized coal, is transported by a 10-m. Fuller-Kinyon pump from the central coal-preparing plant to service bunkers at the burners. Each kiln is provided with one steel service bunker with a storage capacity for 5.5 hr. From the service bunker the coal powder is transported by a double-screw feeder, $\emptyset = 200$ mm., into the discharge duct of the primary air fan, delivering the air-fuel mixture to the burners. The screw-feeders are driven by 3-hp., 7,000 r.p.m. d.-l. motors, with speed control down to 250 r.p.m. Each screw-feeder has a separate motor drive and belt transmission. The primary air fan of 18,500-cu. m. per hr. capacity at a pressure of 250 mm. water column is directly driven through a coupling by a 75-hp., 1,450-r.p.m. motor without speed control.

The secondary combustion air is delivered to the kiln by a special fan with a capacity of 44,600 cu. m. per hr., at a pressure of 50 mm. water column. Generally the secondary air delivered to the kiln is preheated by attaching the intake-line of the fan to the hot clinker chamber. Each kiln has one primary-air and one secondary-air fan. The ready clinker from the kiln, after passing through the hot clinker chamber and cooler, the movement through which is in a direction opposite to that in the kiln, is automatically weighed and delivered to a 300-mm. wide elevator. The clinker is lifted by the elevator to the top of the building and delivered through a chute over the end wall of the kiln house to the clinker storage. During the periods of shut-downs and repair work on the elevator the clinker from the cooler can be transported in cars on a narrow-gage railway to the elevator of the other kiln. Should a cooler be stopped for repairs, the clinker can be loaded directly from the hot chamber into cars and pushed by hand over a narrow-gage line to the clinker storage. The dust collecting in the hot clinker chamber is also handled in this way.

All the controls of the movements of the kiln and the cooler, as well as of the auxiliaries (primary- and secondary-air fans, screw-feeders for raw powder and pulverized coal) are concentrated in one point, by the side of the front head of the kiln. The clinker master operates them. The cold back sections of the kiln are made of brick with reinforced-concrete hoppers, lined with refractory blocks.

The dust collected in the hoppers is taken by a system of screw-conveyors to a 200-mm. wide elevator, is lifted by it to the top floor, and runs down into a 300-mm. screw-conveyor which distributes the dust over a series of small bunkers. From these bunkers the dust is transported by cell feeders to mixing screw-conveyors and then into the kiln.

Clinker Storage.—(Works three shifts, 21 hr., daily and 330 days in the year.)—The clinker storage is adjacent to the kiln house and begins directly from its end wall on the side, where the front heads of the rotary kilns are situated. It is 25 m. wide, 85 m. long and 18.65 m. high. It is at right angles to the kiln house. The available capacity of the storage amounts to 29,000 tons of clinker, corresponding to 31 24-hr. days' output of clinker from 4 kilns. The last aisle of the clinker storage parallel to the end wall is divided into three sections: the first section is a storage for crushed gypsum, the second as storage for clinker admixtures, the third is used to store pea clinker from which lining blocks of clinker concrete are made. The clinker storage is served by an overhead traveling crane made by B & W, with a 25-m. span and a grab-bucket of 3-cu. m. capacity. The rate of lifting of the bucket is 40 m. per sec., the bucket travels at a rate of 65 m. per sec. and the crane at 150 m. per sec. The crane is served by three motors: the lifting motor of 105 hp., the bucket motor of 12.5 hp., and the crane travel motor of 40 hp. This overhead grab-bucket crane performs the following duties: (1) It takes the clinker from the kilns and distributes it over the storage for seasoning; (2) It transports the seasoned clinker to the bunkers of the cement mills; (3) It transports crushed gypsum and admixtures from their respective storage sections to the bunkers at the cement mills; and (4) it feeds the pea clinker of the bunker of the lining-blocks shop.

Cement-Mill House.—(Works 3 shifts, 21 hr. daily and 330 days in the year.)—The cement-mill house is situated beyond the second longitudinal wall of the clinker storage. Close to it in front of the mills are seven bunkers of reinforced concrete; of these three are for clinker, three for gypsum and two for admixtures. Each clinker bunker serves one clinker mill; each gypsum or admixtures bunker can serve simultaneously two mills.

The storage capacity of the clinker bunker is sufficient for 6.5 hr. of operation of the mill. In the first stage of installation work two Unidan 4-compartment mills, 2.2 by 12 m., made by Smidth, were installed. The output of one mill as guaranteed by the maker is 17 tons per hr., at a fineness of 90 per cent. through a sieve of 70 meshes per cm. (4,900 per sq. cm.), with clinker

seasoned during three weeks at the clinker storage and clinker pieces fed to the mill ranging from 20 to 30 mm. in size.

Each mill is fed by means of plate feeders, made by Smidth, 1,800 mm. in diameter for clinker and 1,000 mm. in diameter for gypsum and admixtures.

The charge of each mill is 48 tons, of which 26.5 tons consists of steel balls ranging from 30 to 90 mm. in diameter, and 21.5 tons of "steel pebbles" with diameters from 13 to 19 mm. Each mill is driven by an 800-hp., 730-r.p.m. motor coupled to it through a Wuelfel reducing gearing. The mills are served by two overhead traveling cranes with hand-operated lifting gear: one 6-ton crane at the discharge end of the mill and one 3-ton crane at the charging end. The motor compartment is also equipped with a 6-ton hand-operated overhead traveling crane. The second stage of installation work comprises one 3-compartment mill, made in the U.S.S.R. 2.2 by 13 m., with an output of 18 tons per hr. at a fineness of 90 per cent. through a sieve of 70 meshes per sq. m.

The cement coming from the mills, after being automatically weighed, is transported by two 500-mm. screw-conveyors—(one of these is a stand-by unit) to two bucket-elevators with 450-mm. wide buckets (one of the elevators is also a stand-by unit). The elevators discharge the powder into a bunker of reinforced concrete in front of Fuller-Kinyon pumps. There are two 10-in. Fuller-Kinyon pumps made by Claudius Peters (one of the pumps is a stand-by unit). The makers guaranteed a capacity of 80 tons per hr. The pumps are driven by 175-hp., 970-r.p.m. motors directly coupled to them. The cement powder is delivered by the Fuller-Kinyon pumps through an 8-in. pipeline to the silos.

To catch the dust from each mill there are installed two bag filters with 32 ducts and one exhausting fan with a capacity of 165,000 cu. m. per hr. at a pressure of 125 mm. water column. The dust collected in the filters is transported by a 150-mm. screw-conveyor to the screw-conveyors removing the cement powder from the mills.

Gypsum and Admixtures.—A common storage is allotted to gypsum and admixtures, with a floor space of 1,000 sq. m.; it is situated just beside the clinker storage. To transport the gypsum and admixtures to the storage a standard-gage siding has been run to it. Gypsum and admixtures from the storage are pushed by hand in trucks over a narrow-gage railway to a Blake crusher, 600 by 600 mm. in size, with a capacity of 16 tons per hr. The crusher can disintegrate the daily quantity of gypsum and admixtures in 7 hr., assuming 2 per cent. gypsum and 10 per cent. admixtures consumption on a clinker base. Gypsum from the crusher is transported by a 300-mm. wide elevator to the gypsum section of the clinker storage and the admixtures by the same elevator are discharged on a belt-conveyor 400 mm. wide and carried by it to a bunker in the department for drying and mixtures. Volcanic travertine is used as an admixture; its specific weight is 1,000 kg. per cu. m. and the initial moisture content is 16 per cent. To dry the travertine one tubular drier, made in the U.S.S.R., has been installed, 2.2 by 14 m., the volume of its drying space beiing 53.2 cu. m. For a performance of 30 kg. evaporated water per cu. m. of the drier space at 16 per cent initial moisture and 0.5 per cent after drying, this tubular drier can cover the daily demand for travertine in 12 hr. work. Raw material from the bunker is fed into the drier by a plate-feeder 1,000 mm. in diameter and the dry material from the drier is transported by a 300-mm. wide elevator to the admixtures section of the clinker storage. Dust from the drier is removed by means of a cyclone and exhauster fan of 14,480 cu. m. per hr. capacity at a pressure of 125 mm. water column. The dust collected in the cyclone flows through a chute to the elevator following the drier. The drier furnace is a hand-operated bar grate designed to liberate heat on a basis of 1,500 cal. per kg. of evaporated water.

Cement Silos and Packing Department.—The cement is stored in eight cylindrical reinforced-concrete silos, 11 m. in diameter and 21.6 m. high. The shells of the silos rest on reinforced-concrete pillars. They are arranged in two rows, four shells in each. The total capacity of the eight shells, when filled to 0.9 of their volume, amounts to 23,600 tons of cement. This corresponds to a 25/24-hr. days' output of the grinding equipment of both stages of construction. The silos are charged, as has been mentioned, through a pipeline by a Fuller-Kinyon pump. The silos are discharged by double discharge screws 500 mm. in diameter, two screws for each silo.

The discharge screw-conveyors are fastened to the bottoms of the silos and deliver the cement to longitudinally-arranged screw-conveyors, 500 mm. in diameter. Beneath each row of silos there are installed two longitudinal screw-conveyors, 500 mm. in diameter (one is in operation, the other is a stand-by unit). The screws convey the cement to two 450-mm. wide elevators (one is a stand-by unit). The elevators lift the cement and discharge it into a steel distributing bunker, 1,500 mm. in diameter. From this the cement can flow either to a sieving screw-conveyor, 480 by 3,580 mm., or to a 500-mm. screw-conveyor transporting the cement into eight reinforced-concrete measuring bunkers of nine tons capacity each and then to railway cars for bulk shipment. The reinforced-concrete bunkers are placed over a standard-gage railway track passing along the silos building in such a manner as to allow cement from two bunkers to be discharged simultaneously into one car. Four cars can be loaded at a time, a normal 16-ton car being filled in 15 to 20 min.

Besides being loaded in bulk, cement can also be shipped in paper bags. Packing into bags is performed by a Bates machine. From the sieving screw-conveyor, 480 mm. in diameter and 3,580 mm. long, cement flows to a 400-mm. screw-conveyor, which distributes it over reinforced-concrete bunkers placed above the Bates packing machines. Each machine is served by a separate bunker of 45 tons capacity. Of the four machines to be installed ultimately, one 3-pipe machine with a capacity of 30 tons per hr. was installed in the first stage of construction.

To eliminate the dust from the packing machines, screw-conveyors and elevators there have been installed two 48-duct bag filters with an exhausting fan of 9,800-cu. m. per hr. capacity at a pressure of 175 mm. water column. Dust from the filters is transported by a screw-conveyor, 150 mm. in diameter, to the main cement elevators. To transport the dust from the packing machines screw-conveyors 200 mm. in diameter have been installed under the machines; the screws discharge also into the main cement elevators. The packing department has a storage for paper bags, occupying 350 sq. m. of floor space and capable of storing 800,000 bags, corresponding to a 40 days' output of the factory. From this storage the paper bags are transported to the packing department by a rubber-belt conveyor, 900 mm. wide and 15,000 mm. long.

Fuel and Fuel-Preparing Plant.—As fuel for the technological process and for steam generation a blend of 75 per cent. lignite and 25 per cent. coal is used. The ultimate analysis of both the coals and of their mixture is given in the table in percentages.

	Lignite	Coal	Blended Coal (75% lignite and 25% coal)
Carbon (C)	36.00%	67.00%	48.75%
Oxygen (O)	10.50%	5.00%	9.13%
Hydrogen (H)	2.70%	3.85%	2.97%
Nitrogen (N)	0.70%	0.92%	0.76%
Sulphur (S)	0.10%	0.23%	0.14%
Water (H_2O)	30.00%	8.00%	24.50%
Ash (A)	20.00%	15.00%	18.75%

Lower heating value as fired: Lignite, Qph = 3,140 cal. per kg; coal,

Qph = 6,210 cal. per kg.; blended coal, Qph = 3,900 cal. per kg.

The lower heating value of dried blended coal—at a residual moisture content of 8 per cent. for lignite and 1 per cent. for coal—is Qph = 5,000 cal. per kg. The consumption of undried coal in tons per hour at full capacity at the factory (280,000 tons yearly) is as follows:

	Drying of Raw Materials (tons)	Drying of Coal (t·n·)	Clinker Production (tns)	Power Production (tns)	Total Consumption (tn)
Lignite	2.154	1.383	13.748	1.494	18.8
Coal	0.724	0.460	4.60	0.50	6.3

Coal arrives at the storage in standard-gage cars. It is unloaded by hand and stored in heaps by means of a grab-bucket derrick on railway trucks. The crane serves a 21-m. radius and the capacity of the bucket is 3 cu. m. The same crane reloads coal from the storage heaps into a rolling 5-cu. m. bunker from which coal is fed to the cable-line buckets of 3-cu. m. capacity. In these coal is transported to the bunkers of the coal-preparing plant by winches. The coal is crushed in two roll-crushers, 600 by 600 mm.,, made in the U.S.S.R., of 16 tons per hr. capacity each. Each crusher is fed from its separate bunker by a belt-conveyor, 600 mm. wide, at a rate adjusted by a variable control. From the crusher the coal is lifted by a 450-mm. wide elevator, and is discharged on a 600-mm. wide belt-conveyor, which in its turn discharges the coal on another 600-mm. conveyor, by which it is distributed among the bunkers of the coal driers.

The design provides for 4 tubular driers, 2.2 by 14 m., of the open type, without brick setting, made in the U.S.S.R. The drying is conducted on the parallel-flow principle. With a volume of the drying space in each drier of 53.2 cu. m. and at an evaporation of 30.9 kg. of water per cu. m., three driers can meet the demand of the factory in dried coal, so that the fourth is a stand-by unit. The first stage of installation comprised three driers. Each drier has its own separate bunker for raw crushed coal. The bunker capacity is 56 tons. From this the coal is fed to the driers by plate feeders, 1,000 mm. in diameter. Dried coal from the drier is led to two longitudinally-arranged screw-conveyors, 500 mm. (one is a stand-by unit) by which it is transported to two 450-mm. elevators (one is also a stand-by unit). The coal is then lifted by the elevators and flows down into two screw-conveyors, 500 mm. in diameter (one is a stand-by unit) and is distributed by them over the coal-mills bunkers. The driers are heated by pulverized-coal furnaces, there being one furnace for two driers. The furnaces have been designed assuming a specific heat consumption of 1,500 cal. per kg. of evaporated water. There is a reinforced-concrete bunker for each furnace, the bunker being charged with powdered coal by a Fuller-Kinyon pump. Powdered coal is fed to the furnace by a double-screw feeder, 105 mm. in diameter. The primary air is provided by one fan for every furnace, delivering 4,230 cu. m. per hr. at a pressure of 200 mm. water column. Secondary air is delivered by fans of 23,590-cu. m. per hr. capacity at a pressure of 50 mm. water column. There is one fan for each furnace. Dust elimination from the driers is performed by a chamber filter with metallic filling and an exhausting fan of 29,490-cu. m. per hr. capacity, at a pressure of 200 mm. water column. In case of maintenance work or cleaning of the filters the gas can be by-passed from the drier direct to the chimney. Dust collected in the filters is transported by a system of screw-conveyors to the discharge screw-conveyors for dried coal from the driers.

The design provides for four mills to pulverize the dried coal. The first stage of construction comprised two 2.2-m by 8.8-m. Smidth 2-compartment mills of 10-tons per hr. capacity each, at a fineness of 90 per cent. through a sieve of 70 meshes per cm. (4,900 per sq. cm.) the size of the coal pieces fed to the mill being 20 to 30 mm. The mills are driven through reducing gears by 500-hp., 730-r.p.m. motors. The grinding-media charge of the mills weighs 35,000 kg., 13 tons of steel balls from 30 to 60 mm. in diameter and 12 tons of "steel pebbles" from 13 to 16 mm. in diameter. Each mill has a charging reinforced-concrete bunker of 70-cu. m. capacity from which the coal is fed to the mill by Smidth plate feeders. The powdered coal from the mills flows into 500-mm. screw-conveyors (one operating, one a stand-by unit), which transport it to two 450-mm. wide elevators (one is a stand-by unit). The elevators lift the coal to steel bunkers of 24-ton capacity. It then flows to Fuller-Kinyon pumps. The second stage of installation work comprises two coal mills, made in the U.S.S.R., 2.2 by 8.67 m. with an output of 10 tons per hr. at a fineness of grinding of 90 per cent. through a sieve of 70 meshes per cm. The mills will be driven by central motors of 500 hp., 730 r.p.m. through a reducer. The ready powdered coal is pumped to the consumers by two 10-m. Fuller-Kinyon pumps made by Claudius Peters and installed at the coal-preparing plant. The makers guarantee a capacity of 40 tons per hr. per pump. The Fuller-Kinyon pumps are driven by 75-hp., 1,000 r.p.m. motors directly coupled. The Fuller-Kinyon pumps for powdered coal serve 8 pipe-lines conveying the coal to the following consumers: (1) tubular-drier department for raw materials; (2) tubular driers department for coal; (3) rotary kilns; and (4) the stand-by boiler-house. A service, 6-ton, hand-operated traveling crane runs over the mill drives. Another such crane serves the mill motors. There is a temporary dust-elimination plant consisting of cyclones and fans. It is intended to design a general aspiration plant when work on the second stage of construction of the coal-preparing plant is started.

Central Compression Plant.—This plant is located in a separate building, situated at a point about equally distant from the consumers of compressed air. The first stage of installation work comprised three 2-stage vertical compressors made by the French firm, Five-Lille. Space is provided for the installation of the fourth unit. The makers guarantee an output of 40 cu. m. per hr. at 7 atmospheric pressure for one compressor. The total capacity at the plant is thus 120 cu. m. per hr. Each compressor is provided with an air-filter on the suction line, an intercooler for air passing from the first to the second compressor stage, and a receiver 2,000 mm. in diameter. The compressed air from the receiver, after passing through two coolers arranged in series, enters a common main, from which it is led to receivers installed at the Fuller-Kinyon pumps. The compressors are driven by 320-hp. motors through belts. For maintenance work a 5-ton hand-operated overhead crane has been installed.

The Lining-Blocks Shop.—The baking zone of the rotary kilns is lined with clinker-concrete blocks made at the factory. The clinker in small pieces (pea clinker) and powder used in the production of the blocks are subjected to a special baking process. The blocks are pressed by 6 presses driven through a transmission and installed in the lining-blocks shop.

Auxiliary Shops.—The following auxiliary shops have been erected at the factory: (1) machine-shop and forge; (2) laboratory; (3) joiners' and repair shop; (4) raw-material store; (5) lubricating-oil store; (6) locomotive depot; (7) garage; (8) stables.

The second stage of construction includes a foundry for iron and brass castings and a cast-iron billets store.

Power Service.—The factory has its own power-plant. The turbine-house equipment consists of two 3,000-kw. steam turbines, each driving 3,300-v. alternators. Both turbines and generators have been made in the U.S.S.R.

(Continued on page 64)

By LEO T. PARKER

The Validity of Contracts Made by Salesmen or Other Agents

A GREAT majority of litigations involving non-metallic products, as rock, sand, gravel, concrete, and the like, result from misunderstandings regarding sale contracts made by salesmen, agents, or other representatives. Generally speaking, those who understand the well-established law on this subject may entirely avoid liability, or prepare to win favorable verdicts in unavoidable suits involving contracts made by agents.

First, it is important to know that an ordinary salesman has only *implied* legal authority to accept an order and send it to his employer for approval. If the employer is not satisfied with the offer submitted, he may ordinarily reject the order or proposal. Conversely, the buyer *always* is privileged to send his cancellation of an order at any time before the salesman's employer acknowledges it, irrespective of contrary clauses in the contract of sale.

In other words, the law is settled that a salesman is merely a "special agent", whose implied authority extends no farther than to solicit a buyer's orders or proposals. Many higher courts have rendered decisions supporting this assertion.

Another important point of the law is that since a salesman is merely a "special agent", having limited authority, the manufacturer or seller of nonmetallic products never is liable for guarantees made by ordinary salesmen. Yet, if warranties are specified in the contract, both the buyer and seller are bound, if the seller accepts or approves the order.

Obviously there are some exceptions to this general law. However, the only broadly-stated exception is that a seller may increase the *usual* or *ordinary authority* of his salesman *by performing any act, making any statement, or doing anything that leads the purchaser to believe* that the salesman has increased authority to make or complete valid contracts of sale. This is so because any employer may authorize an agent to act *fully and completely for him,* or he may instruct others that the agent has this greater authority, thus making himself liable for all acts, contracts, agreements, and statements made by the salesman relating to the scope of the employment.

Contract Binding.—Generally speaking, all purchasers who transact business with salesmen, agents, or representatives, are bound to ascertain the extent of their authority. Failure to do so may result in liability of the contracting purchaser, although apparently the agent has ample authority to bind his employer. This rule of the law is especially applicable with respect to salesmen and sales agents.

Under all circumstances a contract which limits the authority of an agent is valid. Moreover, a representative can not without authority vary a written contract of sale.

For example, in *Barber v. Proksch,* 232 N. W. 232, it was shown that a company leased from a manufacturer a concrete spreading machine. The lease provided that neither party could cancel the lease until five months after the date of the delivery of the machinery and equipment. The company did not cancel the lease in accordance with the terms of the contract, but went to the sales agent with whom it had had all its dealings in regard to the machinery. The testimony proved that the sales agent agreed that, if the company would return all the machinery at its own expense, the manufacturer would release the company from all further liability under the contract and lease. The company returned the machinery, but the manufacturer sued to recover the rental on it amounting to $600 a month, on the contention that the sales agent exceeded his authority when he informed the company that it would be relieved from further liability for payment of the rental if it returned the machinery. The higher court held the manufacturer entitled to recover the rental, saying:

"It is true that a selling agent would not have the authority to release a debtor from liability upon return of the goods sold unless there were proof of a ratification by the seller."

Oral Agreement Not Binding.—Obviously, neither a manufacturer nor a seller is obligated by *oral* agreements made by his salesmen, if the purchaser signs a written contract or order. In other words, the sole implied authority of a salesman is to solicit orders and send them to his employer for acceptances. Another important established rule of the law is that a purchaser can not change or vary the obligations expressed in a written contract by introducing testimony showing that the salesman or his employer made oral promises, if the contract contains a clause that oral agreements made by the salesman are not binding, or that the order is not a contract until accepted by the manufacturer.

For illustration, in *Portland Cement v. Whitmore,* 150 S. E. 607, it was disclosed that a salesman, employed by a manufacturer, obtained a written order for two carloads of cement, signed by the purchaser. The order blank had printed thereon: "Orders are not binding on this company unless accepted by the general office." When controversy developed over payment for the cement the manufacturer filed suit. The purchaser attempted to avoid liability by proving that the salesman had stated that he had sold two cars of cement to a contractor, and the salesman would allow the purchaser 20c. per bbl. for unloading, hauling, storing, and reloading the cement into the contractor's trucks, and collecting the money from the contractor. Although the lower court held the purchaser not liable, the higher court reversed the verdict, saying:

"The defendant company (purchaser) had notice from the order blank itself that the agent did not have authority to contract, but only to accept orders. But, even had he had such authority, the fact that the defendant (purchaser) had signed the written order, the law presumes that all preliminary negotiations were included and merged in the writing. The order in the present case was clear on its face and contained no notation suggesting any other understanding than that contained therein."

In another case, *Corporation v. Leonard,* 174 N. E. 511, it was disclosed that a purchaser signed an order for one ton of a nonmetallic wall composition at 18c. a lb. When the shipment arrived, the purchaser refused to accept delivery of the material on the contention that the salesman had verbally promised a rebate of 2c. per lb., if the purchaser ordered a ton.

The seller sued the purchaser to recover the price specified in the order. The purchaser attempted to avoid liability on the ground that he did not read the order and, therefore, did not know that the price of 18c. per lb. was specified therein. Notwithstanding this contention, the court held the purchaser liable on the contract, and said:

"The defendant (purchaser) testified that he did not read the order signed by him. It is not open to him, therefore, to claim that he was misled by any expression in it or by its form."

Agent Has Authority.—Of course, if an employer authorizes an agent to make valid contracts, the employer is bound by the terms of all contracts made by his agent, although subsequently the employer is dissatisfied with a deal.

For instance, in *Southern v. Gravel Company,* 124 So. 548, it was disclosed that an employer sent his employee to inspect and purchase material. When the material arrived, the employer was dissatisfied with its quality and refused to accept delivery. The seller sued the employer. The court promptly held the employer liable, saying:

"The fact that Dalton (agent) had full authority to make the selection of material to be shipped and in that respect to bind defendant (employer) can not be, and in fact is not, seriously disputed."

Must Use Good Judgment.—While a purchaser of nonmetallic products may rely upon statements of a salesman's employer with respect to the salesman's authority, yet the purchaser *can not* rely with any certainty upon statements made by the salesman about *his* authority to make valid contracts for his employer. On the other hand, it is important to know that an employer may unintentionally lead a prospective purchaser to believe that his salesman has authority to make valid contracts, under which circumstances the employer is liable for all unauthorized guarantees or contracts made by the salesman.

For example, in a quite recently decided case it was disclosed that a contract existed between a manufacturer and his traveling salesman which specified that the salesman had authority to cut prices and meet competition. While the salesman was endeavoring to sell his merchandise to a prospective purchaser he displayed the above-mentioned contract to the prospective purchaser who read it, as a result of which he believed that the salesman actually had authority to bind the manufacturer in contracts of sale. Therefore, he accepted the offer made by the salesman and made a contract with the manufacturer through the salesman. The contract was sent in, and in due course of time the manufacturer received it, but refused to fill the order. The purchaser instituted legal proceedings against the manufacturer to compel the delivery of the material. It is interesting to know that the court held the purchaser legally entitled to recover damages from the manufacturer particularly for the reason that the salesman had displayed to the purchaser the contract with his employer, as a result of which the purchaser was led to believe that the salesman had been authorized to set the price at which the material would be sold by the manufacturer.

On the other hand, a purchaser can not rely upon what the salesman says as to his authority. For illustration, in one case, although a salesman had no authority to bind his employer on contracts of sale the salesman accepted an order from a purchaser which the salesman said was a valid contract obligating his employer. The employer immediately wrote a letter to the purchaser and informed him that the merchandise would *not* be shipped. The purchaser instituted suit against the salesman's employer to recover damages. However, the court held that the employer of the salesman was not legally bound to make the delivery, and explained that in the absence of facts which lead a purchaser to believe that salesman is authorized to bind the firm he represents, the purchaser can not legally consider a contract entered into with a salesman binding *until the employer confirms the order or makes the delivery.*

In still another case, a salesman, whose authority was limited to soliciting orders for delivery, accepted a payment on goods previously shipped. He misappropriated the money to his own use. The court promptly held his employer *not* liable for the money thus paid to him, and the purchaser was compelled to repay the money to the salesman's employer.

Agent Liable for Payment.—Frequently manufacturers of mineral products enter into sales-contract agreements by which the manufacturer sells directly to a distributor who pays the manufacturer and collects the contract price from the purchasers, although by the terms of the contract between the distributor and the purchasers it may appear that the distributor is acting as a representative of the manufacturer. Notwithstanding these facts it is well established that the distributor is solely responsible to the manufacturer for payment. In other words, a contract between a buyer and a seller is valid and enforceable, as between these parties, although others may be led to believe that the buyer is an agent or salesman for the seller, instead of the actual purchaser.

For example, in *Dixie Cement Corp. v. H. Wales Lime Co.,* 178 Atl. 659, it was disclosed that a manufacturer entered into an agreement with a distributor under which the latter agreed to act as distributor and receive invoices when shipments were made and to pay for such invoices as rendered. When an order was secured by the distributor it would send its own order to the manufacturer, giving the name of the buyer to whom the cement was to be shipped. The shipment would be made by the manufacturer to such buyer, and an invoice sent to the distributor. In every case the charge for the cement shipped upon the orders sent by the distributor was made directly against it, and payment was made by it for all such orders. The distributor collected the amount due from the buyer for its own account, making no claim against the manufacturer for any loss sustained by the buyer's failure to pay. On the other hand, a large number of the orders obtained by the distributor and given to the manufacturer were orders taken upon a printed form of contract called a "specific-work contract". This recited that it was an agreement and memorandum of sale between the manufacturer and the named buyer, and these contracts were executed by the buyer and the manufacturer, and signed on the contracts by the distributor *as the manufacturers' agent.*

When litigation was begun over payment of a bill of merchandise shipped by the manufacturer to a buyer, the legal question arose whether under the above circumstances the manufacturer could force the distributor to pay instead of having to rely upon the buyer for payment. It is interesting to know that the higher court held the distributor *solely* liable for payment to the manufacturer, saying:

"Was the defendant (distributor) merely, as it claims, acting as the agent of the plaintiff (manufacturer) in the selling of cement, or was it acting for itself as a principal in the purchase of the cement? . . . The plaintiff (manufacturer) did not come in contact with the buyers under these contracts, which were secured by the defendant (distributor), and as shipments were made invoices were sent to the defendant (distributor) and paid by it . . . The claim of the defendant (distributor) that its patrol agreement . . . is invalid . . . is without merit . . ."

Fraud Relieves Purchaser.—Although a salesman, or other agent, has no authority to make binding contracts, yet the employer is liable for any and all fraud practiced by the agent.

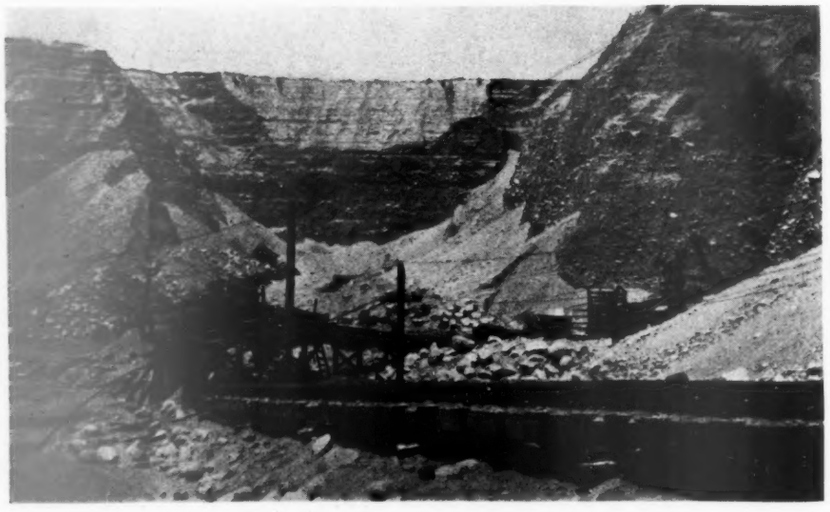
For example, a printed notice on a regular blank order-form is important evidence. It has been held on numerous occasions that a purchaser is bound by the statements on such contract blanks, whether or not he reads them, if he

(Continued on page 64)

MOUNTS JAW-CRUSHER ON RAILWAY CAR

Steam shovel loading over grizzly on crusher car in pit.

Side view of Mr. Griffin's ingenious installation.



Belt-conveyor system in the Roscoe pit.

THE Roscoe, Cal., sand-and-gravel plant of the Consolidated Rock Products Co. of Los Angeles is served by a splendid deposit of considerable depth. The pit is operated to a depth of 100 ft. The first 50 ft. contains mostly small material, but the lower 50 ft. contains numerous large bowlders. It is necessary to operate 100 ft., however, in order to obtain a satisfactory percentage of coarse gravel and sand.

The bowlders in the bottom half of the deposit being worked are often too large to place on the 42-in. main conveyor belt, so R. C. Griffin, production manager, conceived the idea of mounting a jaw crusher on a railway car—bringing the crusher to the rock—to obtain pieces convenient for handling. The jaw crusher is a 28-in. by 36-in. Traylor machine, while the base of an old Marion railroad-type steam shovel serves as the portable carrier.

"As you will observe in the pictures," Mr. Griffin explains, "we have a hopper and grizzly to receive the material direct from the shovels. The fine material goes through the grizzly into the hopper and is regulated in its flow on the belt by a feeder. The big bowlders drop directly into the crusher and are there reduced so that they are no longer a menace to the operation of our conveying system.

"Before the installation of this crusher in our pit, we frequently had large bowlders placed on the belt which would only ride for 50 or 100 ft. and, during that time, knock over one or two conveyer rolls before the stone finally rolled off the belt.

"This installation was built from equipment which we had on hand more as an experiment than anything else in order to see what the action of a crusher of this size would be on a flexible support instead of on a rigid concrete foundation. It has operated continuously from the time we placed it in the pit, and has given us absolutely no trouble from the standpoint of the operation of the crusher. There have, of course, been minor adjustments made to make it work smoothly and to regulate the flow of material onto the belt during the different cycles of operation. These variations required an adjustment on the feeder in order to maintain an even flow on the belt.

"Since placing this installation in operation we have decided on this type of installation for another one of our plants and will build the new installation according to a more suitable design rather than using equipment which we happen to have on hand."

NEW EQUIPMENT AIDS PRODUCT QUALITY

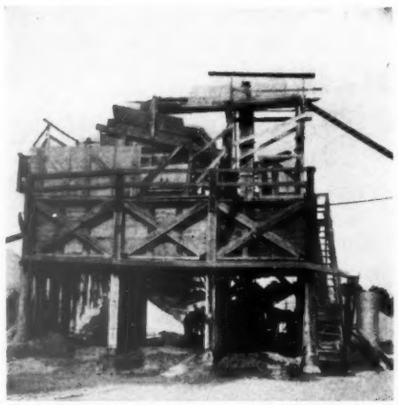
The plant with pipe-line at left, waste flume at right.

Dredge which works the deposit which adjoins the plant.

THE sand-and-gravel plant operated by William Click & Sons near Avoca, Mich., is the chief source of supply for Port Huron, Mich., and its environs. With considerable new business in prospect this season the company took steps to improve its crushing-and-screening facilities to meet the more rigid specifications now in force. These improvements were recently completed and the company now has a modern, efficient plant, which is able to turn out approximately 100,000 tons of specification material annually.

Much of the output during the summer has gone into state highway projects in St. Clair County, while a job of no small proportions was the furnishing of aggregates for the paving of the broad approaches and constructing the concrete piers on the American side of the new Blue Water Bridge, an international span crossing the St. Clair River between Port Huron and Point Edward, adjoining Sarnia, Ont., Canada. The bridge is soon to be dedicated with appropriate ceremonies by President Roosevelt and takes its name from the turquoise color of the river at this point. Mr. Click plans to capitalize on the attendant publicity and rename his plant the Blue Water Sand & Gravel Co.

Material is recovered by a dredge and is carried to the plant by a pipe-line. The cutter-head was installed last summer by the W. H. K. Bennett Co. The 8-in. Hetherington & Berner dredge pump is driven by a Climax gasoline engine. At the plant all the sizing is accomplished by a New Holland 4-ft. by 8-ft. triple-deck vibrating screen recently installed. The oversize gravel is passed to a 9-in. by 16-in. Wheeling jaw crusher and returned by a New Holland 40-ft. bucket-elevator. Another new piece of equipment, a New Holland 30-in. by 16-in. roll-crusher, is used for secondary



Close-up plant view with new vibrating screen visible at the top of the structure.

crushing, also in closed circuit with the vibrating screen. After separation the finished sizes drop into storage bins for loading, all shipments being made by motor truck.

William N. Click is the senior member of the firm. Associated with him are his sons Frank, William J., and Charles.

When the plant was visited in August, production was being utilized in the preparation of road material stabilized with clay and calcium chloride, the stabilizing outfit being set up across the road from the Click plant. This work was being done under contract to the state by E. P. Brady of Flint, Mich. Mr. Brady's equipment, a Pioneer Engineering Wks. No. 73 stabilizing plant, is moved from place to place as occasion demands, in this instance furnishing material for use on State Highway No. 136. The principal equipment consists of a clay feeder, a clay shredder, a pug-mill, a calcium-chloride hopper and

The calcium-chloride stabilizing machine processing material for use on state highways in the immediate vicinity.

A view of the new roll-crusher shortly after it was installed.

feeder, and a delivery conveyor. Automatic, adjustable feeders accurately proportion the amounts of clay and calcium chloride to meet the rigid requirements of the Michigan Highway Department. A fleet of dump trucks carries the stabilized material to the highway site or it is occasionally stock-piled for later use.

Since the work of stabilizing the material is done at various locations during the road-building season, plant workman and truck drivers live a gypsy sort of life. Many of them make their abode in house-trailers for convenience, accompanied by their families. The trailer camp near the scene of stabilizing operations is a familiar sight in Michigan this year.

Novospassk (*from p. 59*)

The second stage of installation work includes one more unit of the same type and capacity. The electric switching panel occupies a separate building, connected to the turbine-house by a fire-proof passage. From the buses of the switching panel high-tension feeders lead to the shop substations, where they end either at the terminals of high-voltage motors or at the terminals of step-down transformers, 3,300/5,257- or 3,300/220-v. for small motors and lighting.

The boiler-house of the power-plant is equipped with three boilers giving steam at a pressure of 19 atmospheric gage superheated to 376 deg. C. One of the boilers, a vertical Garbe boiler of 400-sq. m. heating surface, is installed in a separate so-called "stand-by boiler-house". The boiler has been made in the U.S.S.R. and is equipped with a B & W pulverized-fuel furnace. The rating of the boiler is 20 tons of steam per hr. in normal operation and 25 tons per hr. maximum. This boiler covers the peaks of steam demand and serves as a stand-by unit during descaling and general maintenance work on the two other boilers. The cutters are installed at the rear end of the kiln house, adjacent to the "stand-by" boiler-house. The two boilers made in the U.S.S.R. are of 750-sq. m. heading surface each. The boilers have no furnaces and recover the peat of the waste gases from the kilns; the waste gases enter the boilers at a temperature of 700 deg. C. on the average. As a measure against air infiltration the boilers are provided with sheet-metal casings. Each boiler is placed at the end of one of the kilns, has a separate suction fan of 76,000-cu. m. per hr. capacity at 200 mm. water column, and a separate sheet-metal smoke funnel. The fan is driven by an a.-c. motor with speed control. The speed controller has seven stages and is installed at the front head of the kiln. It is operated by the clinker-master.

Should one of the boilers be shut down, the waste gases from both kilns can be sent through the remaining boiler. However, in this case the output of the kilns must be lowered to three-quarters of their full capacity.

Each of the waste-heat boilers is guaranteed to give 9.5 tons per hr., corresponding to a steaming duty of 12.6 kg. per sq. m. of the boiler heating surface. The dust which collects in special dust pockets provided under the boilers is handled by screw-conveyors which transport it to a 200-mm. wide dust-elevator in the kiln-house; this elevator handles the dust from the kiln compartments.

The operating records of the first two years from the starting of a kiln show the following results: Kiln output 8.5 tons per hr.; output of the coal mills 10 tons per hr.; of the raw-material mills 25 tons per hr.; of the cement mills 18 tons per hr.; waste-heat boiler output 7 tons per hr.

Some time is evidently wanted for the operating personnel to master in full the combined unit "kiln-waste-heat boiler" and thus to attain the output of the design calculations.

Contracts (*from p. 61*)

signs the contract and the notice is in bold type.

Sometimes a saleman promises various and unusual benefits for the purpose of influencing a prospective purchaser to place an order for material. Such promises are of little or no effect, unless the salesman's employer in some manner has signified his intentions of fulfilling the various promises made by the salesman, or has informed the purchaser that the salesman is authorized to make binding contracts.

Frequently it is difficult to distinguish between ordinary and fraudulent transactions. However, a purchaser never is obligated to perform a contract taken or made by a salesman *who used fraud* in any manner to induce the purchaser to make the contract. In other words, an employer always is responsible for fraudulent acts of a salesman.

Of course, the mere fact that a salesman, who sells good merchandise, induces a purchaser to place an order through ordinary assertions, or promises, is not fraud. On the other hand, in one late case a higher court held a purchaser not obligated to accept and pay for sand and gravel, since the evidence proved that the salesman had induced the purchaser to place the order by stating that the price would be increased when, in fact, the price soon afterward was reduced.

Impinger Method of Dust Determination

The emphasis recently placed on the problem of harmful dusts encountered in various industries has caused a marked increase in the number of persons interested in the determination of air dustiness. The many requests for information on the determination of the concentration of dust in the air indicated the need for a detailed description of the impinger method as used by the Bureau of Mines, United States Department of the Interior. A report just issued by the Bureau contains a detailed description of the impinger method, with a history of its development.

The impinger was developed by the Bureau of Mines, in coöperation with the United States Public Health Service, during the course of an investigation of dust-sampling instruments in common use.

The method has been used widely for collecting data on air dustiness in mines and industrial establishments in the United States. Owing to the fact that permissible limits have been established on the basis of impinger results, the impinger method has been rather widely accepted as the standard in this country.

Possible sources of error and limitations of the impinger method are given in the report, so the true significance of the impinger results will be understood, thereby aiding in the proper interpretation of the results.

An appendix is included, which lists the publications dealing with results obtained by the impinger method, equipment needed for using the impinger method, and information that should be collected during sampling.

Copies of this report, Information Circular 7026, *A Technique for Use of the Impinger Method,* by Carlton E. Brown and H. H. Schrenck, may be obtained from the Bureau of Mines, Washington, D. C.

Personal Mention

GEORGE F. STEIGERWALT, who has been connected with the cement-products bureau of the Portland Cement Assn. for a number of years, has resigned to join the association's district office at San Francisco, Cal.

C. L. HAMILTON, formerly at the Loveland, Colo., plant of the United States Gypsum Co. has been transferred to the company's plant at Laramie, Wyo., where he is serving as superintendent. He succeeds D. McKee who was transferred to the United States Gypsum Co. plant at Midland, Cal.

R. H. TOWNSEND has resigned as superintendent of the Calaveras Cement Co., San Andreas, Cal., and has been succeeded by GEORGE B. POORE, JR. MARION S. HEARD has been appointed chief chemist to succeed HAROLD J. DUNTON, resigned.

R. B. FROST, formerly assistant superintendent at the Hudson, N. Y., plant of the Lone Star Cement Corp. has been transferred to the Lone Star plant at Greencastle, Ind., where he is serving in a similar capacity.

W. F. and J. A. ROBINSON have organized the Owensboro Dunbrik Co. at Owensboro, Ky., and have established a plant for the manufacture of concrete brick.

WHARTON CLAY, formerly secretary of the National Metal Lath Assn., has been made secretary of the National Mineral Wool Assn., with offices at New York, N. Y. The organization was formerly known as the National Rock & Slag Wool Assn.

FRED GROTTS, formerly vice-president of the Lebanon Steel Foundry Co., has joined the Chicago Steel Foundry Co. as vice-president, in charge of heat- and corrosion-resisting alloys. He was formerly with Caterpillar Tractor Co., American Steel Foundries and Continental Roll & Steel Foundry Co.

FRANK D. NEWBURY has been appointed manager of the new-products division of the Westinghouse Electric & Mfg. Co., succeeding H. M. WILCOX who died July 28.

J. J. B. RUTHERFORD, formerly of the research laboratory, U. S. Steel Corp., Kearny, N. J., has joined the metallurgical staff of the Babcock & Wilcox Tube Co. as research metallurgist.

FRANK J. TUITE, engineer with the Robins Conveying Belt Co., New York, N. Y., for more than 25 years died July 20.

ELLSWORTH J. JOHNSON, president of the Knickerbocker Slate Corp., New York, N. Y., until his retirement in 1930, died last month at his home in Westfield, N. J.

EDWARD SLOVER, 66, cement-products manufacturer and former mayor of Camden, O., died recently at his home there.

HOWARD H. SARLLS, 67, for more than 20 years manager of the Mt. Vernon, Ind. plant of the Koch Sand & Gravel Co. of Evansville, died suddenly at his home in Mt. Vernon on the night of September 2. For many years before joining the Koch company, Mr. Sarlls was the editor and publisher of the *Mt. Vernon Republican*.

CARL L. PFEIFER, 58, treasurer of the Chain Belt Co., Milwaukee, died suddenly on Aug. 24 in Philadelphia. He had left Milwaukee the day before and was stricken upon his arrival there.

ABRAHAM L. KUHN, 73, a foreman at the plant of the Medusa Portland Cement Co., near Gettysburg, Pa., died September 5 after an illness of several months.

HARRY L. TARBOX, 80, president of the Tarbox & McCall Stone Co., died recently of heart disease at his home in Findlay, O. He formed the company in 1898.

C. PARKER HOLT, 58, vice-president and director of the Caterpillar Tractor Co., and for nearly 40 years affiliated with it and one of its predecessors, the Holt Mfg. Co., died August 24 at his home in Piedmont, Cal.

GEORGE E. SUTHERLAND, 61, prominent business man of Charleston, W. Va., and president and general manager of the West Virginia Sand & Gravel Co., died a few weeks ago. He was a member of the city council of Charleston and had been connected with the gravel company since 1924.

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Foreign Developments

Supercements and Addition of Salts

Cements of high early strength, put on the market for a number of years under the designation of "supercements," owe their special property of high intial strength to a high content of lime, certain extra care in burning and great fineness of grinding. Sometimes, too, various chemical substances are added after burning. The present study was undertaken to investigate the effect on ordinary Portlands of the compounds most frequently employed in connection with high-early-strength cement or metallurgical cements, *i.e.*, sodium chloride, calcium chloride and sodium sulphate; in each instance 1 and 2 per cent. of the salt was added to several commercial Portlands and one high-early-strength cement for the tests conducted.

None of the cements, pure or admixed, showed an expansion of more than 3.7 per cent. Sodium chloride did not appreciably modify the expansion; 1 per cent. of calcium chloride slightly diminished the expansion of two of the ordinary Portlands and the high-early-strength cement and slightly increased it in another Portland, while 2 per cent. of the same salt increased the expansion in all cases but one of the cements: sodium sulphate usually diminished the expansion, especially in the 2-per cent. admixture.

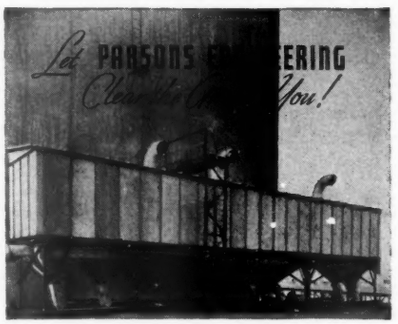
In the setting test only calcium chloride had a clearly notable effect. Setting time was a little diminished in two cases, little more in the 2-per cent. mixture than in the 1-per cent. mixture. Set was always much shortened, by 1 per cent. of calcium chloride and still more by 2 per cent. Sodium sulphate slightly accelerated two of the cements stored in air, but had little effect on the other Portlands and the high-early-strength cement stored in air, or any of them in water storage.

The effect on strength was very much the same for the various cements, including the high-early-strength cement. In the bending strength tests the most remarkable result was at the end of two days, at which time the increase in strength was generally about 14 per cent. At longer periods the strengths of cements admixed with calcium chloride or sodium sulphate were about the same as the initial cements, and those admixed with sodium chloride a little less. In the compressive strengths the initial increases produced by the salt admixtures remained better through the longer periods, especially with the calcium chloride, but the increases always diminished as the period increased and in some instances the cements finally showed less strength than the same cements in their natural condition.

Some of the materials used as admixtures, especially the calcium chloride, are hydrometric salts and their presence in cement makes the storage problem difficult. The sacks have to be strengthened, and the cements can not be stored long before use. Certain manufacturers furnish the salt admixture in a separate sack to be added at the mixer.

Except in some instances in the case of sodium sulphate, none of the salts accelerated the decomposition of mortar in aggressive solutions; on the contrary, they almost always retarded it, but did not prevent it ultimately.—R. Feret in *Revue des Materiaux de Construction et de Travaux Publics,* No. 345, June, 1938, pp. 101-106.

The Twin Disc Clutch Co. announces the opening of a new parts and service depot at 195 Tenth Ave., New York, N. Y.



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Traffic News Digest

I. C. C. DECISIONS

Crushed Stone.—In response to fourth-section application No. 17,300 the commission has granted authority to carriers to establish and maintain interstate rates on crushed stone in carloads from Bowmansville, N. Y., to destinations in Ohio, New York and Pennsylvania without observing the long-and-short-haul clause of Sec. 4, subject to the usual circuity limitations.—I. C. C. F. S. O. No. 13,204.

Motor Rates.—The decision of the commission in the case of central states motor rates is of interest to members of the nonmetallic-minerals industries not only because they are using common-carrier motor service extensively but also because the report indicates that this decision will be used as a basis in dealing with contract motor carriers.

The proceeding grew out of a petition filed by the Central States Motor Freight Bureau, Inc., calling the attention of the commission to the deplorable financial condition of common carriers in general within central territory and asking an investigation of the rates, rules, regulations and practices of all common carriers of property between points in the territory, and the issuance of a minimum rate basis as the only means of preventing rate wars. The bureau represents about 750 common carriers who are members of the bureau, and 550 other common carriers who publish their own tariffs and who worked with bureau members for uniform action. They estimated that these carriers transported between 85 and 90 per cent. of the traffic moving by motor common carriers in the territory involved. This includes points in Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, New York, Ohio, Pennsylvania, West Virginia and Wisconsin. In this territory there are approximately 1,000 other common carriers who met and published their rates independently of this bureau. It was the contention of the petitioners that these other common carriers were publishing rates so low that bureau members, in order to compete, had to operate at a loss. The petition of the bureau was opposed by the chambers of commerce of Cleveland, Toledo and the State of Indiana and by the Chicago Association of Commerce. In the report commenting on the expense of operation the commission said:

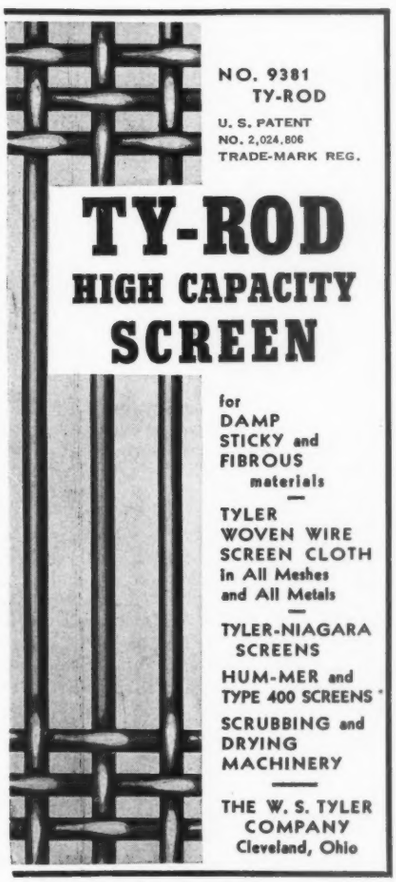
"In the past year substantial increases have occurred in the prices of tires, gasoline, oil and motor vehicles, and there has been a marked increase in the cost of labor. Regulation has also added to the traffic and tariff expenses of the respondents. It is estimated that since 1935 the all-expense cost has increased 20 per cent. The average expense per ton of 121 carriers in 1936 was $6.50, while for two months in 1938 it was $7.54, an increase of 16 per cent. The decreased tonnage of high-grade manufactured articles has reduced gross revenues and net earnings.

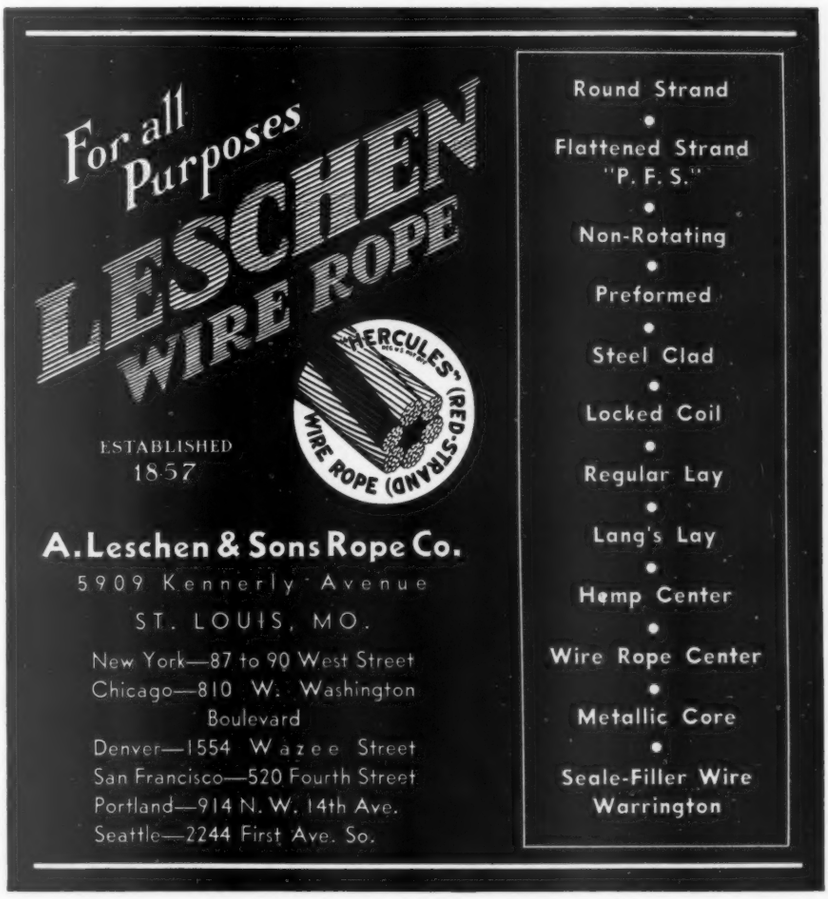
"A consolidated statement of the incomes, traffic and operating statistics of 13 central territory carriers shows that in 1937 such carriers, as a whole, sustained an operating loss of $668,064.40. The total operating revenues were $19,033,114 and total operating expenses $19,701,181 reflecting an operating ratio of 104 per cent. In the first three months of 1938 operating expenses exceeded operating revenues by $210,945, resulting in operating ratio of 106.5 per cent. In 1937 the average revenue per truck-mile was 20.3 c., the average expense per truck-mile 21 c., the average revenue per ton-mile 3.04 c., the average expense per ton-mile 3.15 c., the average haul 250.05 mi., and the average load 6.66 tons. The result of the three months' operation in 1938 is less favorable. The bureau submits that the operating ratio of a common motor carrier should not be greater than 85 per cent in order that a reserve may be accumulated to provide security for periods of recession in traffic, and emergencies such as floods or other disasters.

"The 13 carriers were selected because they transport general commodities and have operations in substantially every part of the territory, some being large, others small. The revenues of such carriers were approximately 21½ per cent. of the revenue of the 200 carriers, to which reference has been made.

"Respondents also introduced a compilation for 41 carriers, whose revenue aggregated approximately 35 per cent. of the revenue of the 200 carriers. That the operation of the 13 carriers, for which the detailed study was made, is typical is apparent from the fact that the revenues and expenses per truck-mile are substantially the same as for the 41, and the 200 carriers are approximately the same. Thus, for the first two months of 1938, the operating ratio of the 200 class I carriers was 105.7 per cent.; for the 41 carriers the same, 105.7 per cent.; and for the 13 carriers 106.5 per cent."

At the hearing there was some contention that the establishment of a minimum-rate level by the commission would result in driving traffic to contract carriers. On this point the commission said:





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Stationary & Portable Rock and Gravel Crushing and Screening Plants—Single and Double Roll Crushers—Revolving and Vibrating Screens—Conveyors.

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"The evidence, however, sustains the contention of the bureau carriers that it is necessary to establish a uniform basis for common-carrier rates, before it is possible to attack the similar problem of contract-carrier rates, and that the issuance of a minimum-rate order with respect to common carriers alone would not prejudice them unduly in favor of contract carriers, railroads or forwarders.

"The class rates and provisions relative thereto contained in bureau tariffs have been in effect generally since their establishment effective April 1, 1936. We are of opinion that the class rates published by the bureau subject to the ratings provided in the governing classification and exceptions are reasonable minimum rates for application to all traffic of the respondents on which commodity rates are not hereinafter prescribed or approved.

"The level of the proposed commodity rate is, if anything, lower than that which we would prescribe, if it had been possible for us to enter into a detailed investigation of all the individual rate situations involved, particularly if the problem were not complicated, as our present problem is complicated, by the pressure of the most intense competition with contract carriers, railroads, forwarding companies and steamship lines. Upon the whole, the evidence requires that the class and commodity rates proposed by the petitioning respondents, except as hereinafter modified, be found to be just and reasonable minimum rates for application by all common carriers within this territory."

While the commission prescribed rates for application in this territory, which followed generally the rates published by the bureau, there were many exceptions made to the bureau rates. Unlike decisions involving railway rates, the commission in this case welcomes petitions by the carriers to eliminate any inconsistencies that may be apparent in the rates prescribed, and says that, "We will keep the proceeding open to permit any party by a petition to request the amendment of the order for the purpose of removing any undue discrimination or prejudice resulting from the rates herein prescribed as minimum". The minimum rates prescribed by the commission are generally those on file with the commission on June 11, 1938, listed in the decision, which include those published by the bureau and certain items in the tariffs of individual companies listed in the report in order. The rates prescribed are to become effective not later than Oct. 25.—I. C. C. Docket No. Ex Parte MC 21, Motor Carrier Rates in Central Territory.

EXAMINERS' REPORTS

Sand.—Examiner Harold M. Brown proposes that the commission find the rate of 75 c. a ton on sand front La Grange, Mo. to Montrose, Ia., unreasonable to the extent that it exceeded 65 c. and award reparation of $199.01 in I. C. C. Docket No. 28,005 Cameron, Joyce & Co. v. Burlington.

Sand and Gravel.—A very interesting case has developed in Illinois in the attempt of railway carriers to make rates to meet the competition of wayside sand-and-gravel pits. In this case a rate of $1.01 was charged on 66 carloads of washed and graded sand and gravel shipped from La Grange to Gladstone, Ill. between Sept. 8 and Oct. 9, 1934. The shipper contends in the complaint that this rate was unreasonable to the extent that it exceeded 60 c. The complaint also involves 304 carloads of sand and gravel between other points on which the tariff rate was charged but on which the carrier later reduced the rate to an amount which the complainant feels is reasonable. The commission was asked to award reparation amounting to $1,517.38 on the 66 carloads and to waive undercharges of $7,294.42 on the other shipments.

After the original complaint was filed it was followed by another petition asking the commission to use its permissive power as distinguished from its affirmative power. This grows out of the fact that the commission had formerly prescribed rates for application on sand and gravel in Missouri Gravel Co. v. CB&Q, 132 I. C. C. 200 and 190 I. C. C. 465. In this case the commission had prescribed as maximum reasonable rates a mileage-scale basis. After that time it was found that the prescribed rates were generally too high to move the traffic and since the railroads had not been able to devise any uniform scale they would not result in too great reductions in some instances and not enough in others the prescribed rates had been retained in the tariffs as the normal basis.

Under the sponsorship of the Illinois commission a plan had been devised to meet each intrastate situation as it arose under which any producer of sand and gravel to meet the competition of water, truck or wayside pit or quarry might file an application for the rate deemed necessary to furnish the material for any particular project. This reduced rate basis is used in making bids, after which the Illinois commission authorizes the reduced rate or rates; generally carrying an expiration date. Under the principle established in the Arizona Grocery Co. case, 284 U.S. 370, the commission can not require the carrier to pay reparation on any rate which the commission itself has found not unreasonable.

"In the present case the carrier is willing to pay the reparation and to waive the undercharges but can do so without authority of the commission. The complainant in the case takes the attitude that while the commission can not require the carrier to pay reparation it

(Continued on page 71)

WE GAVE PIPE *a new twist*

WE gave it this new twist a long time ago. It was the spiral twist—and it proved to be a revolutionary idea. The spiral seam gave light wall pipe greater rigidity and strength than it had ever had before. Year by year we have improved it—strengthened the seam; developed protective coatings for all services; broadened the range of sizes, wall thickness, and joints.

FOR your dredging lines, pontoon lines, sand and gravel lines, water lines and all similar services, this time-tested, but ever-modern pipe will handle the job at half the installed cost of any other type of pipe that you could use.

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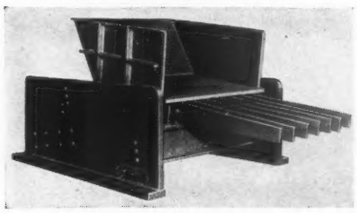
ASK FOR CATALOG 36

New Machinery and Supplies

• Vibrating Feeder

The new Utah electro-magnetic vibrating grizzly feeder made by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., is a combination of its Utah vibrating feeder and cantilever grizzly.

The regular cantilever grizzly operates on the principle of particles falling on bars which



Electro-magnetic grizzly feeder.

are supported only at the head end. The impact of the heavy pieces of material causes the free ends of the bars to vibrate and thus increasing screening efficiency. The Utah electro-magnetic feeder is a high-frequency alternating-current vibrating feeder which operates without motor-generator sets, sliding or rotating parts, and is an excellent feeding mechanism for both fine and coarse material.

The combination of the Utah vibration and the cantilever-grizzly principle makes a highly-efficient combined feeder and scalping unit for use ahead of crushers to scalp out the fines from the crusher feed; for use in loading conveyor-belts by cushioning the fall of coarse material on the fines which would drop through ahead of it, and for many miscellaneous purposes around material-handling plants.

The new feeders are made in all sizes from 18-in. to 72-in., and for any reasonable capacities.

• Excavator

A new excavator in the ¾-cu.yd. class—the General 41—has been announced by the General Excavator Co., Marion, O.

The General 41 is characterized by high speed and mobility. Two travel speeds are obtained through speed change gears and in addition, the gasoline motor may be quickly accelerated at the will of the operator. Another feature is its chain crowd. A split sprocket is bolted to the right hand drum shaft, and serves as a crowding unit. No special crowd unit need be placed on the machine. Boom is adjustable to all angles without affecting crowd-chain tension. Retract motion—twice the speed of crowding motion—is obtained from a horizontal intermediate shaft which carries a friction clutch on one end, and

High-speed, mobile shovel.

sliding gears with selective-jaw clutch. This same intermediate shaft also motivates the power-boom hoist which is independent of hoist, swing and travel motion and is of the worm and worm-gear type, oil-bath lubricated. An automatic band brake on the worm shaft is an added safety feature.

All high-speed shafts are ball and roller bearing mounted. Alloy steels of special analysis are used, throughout, wherever special characteristics of toughness, wear resistance or tensile strength are required.

Hoist drum clutches and brakes are of the outside contracting band type with wide faces and large diameters for easy and efficient operation. Clutches are set by the General Easy Touch booster mechanism. Swing and travel motions are controlled by two friction reversing clutches of disc type. Selective jaw clutches are used to engage either the swing motion or travel motion.

A new, fully enclosed stream-lined cab protects all machinery from theft and weather, provides complete accessibility to all parts and gives the operator full vision to front, sides and above, with plenty of light and ventilation.

• Power Unit

A new 4-cyl. engine for industrial use in the low power range has been added to the Waukesha Motor Co.'s line. Developing 10-18

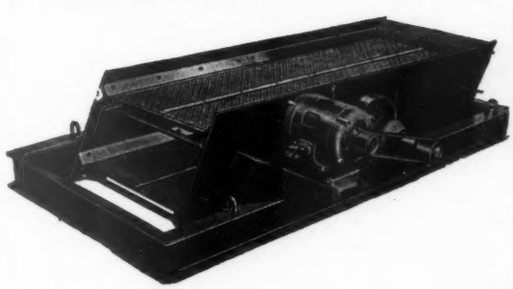
Engine from intake side.

horsepower, this unit is ideal for use with light weight vehicles, 5- to 10-kw. generators, or as a starting motor for large engines or power units. Its field of service is considerably widened by the fact that various cylinder head combinations are available which permit operation on gasoline, natural gas, or butane.

The oiling system is unusual. Oil is forced under pressure from a positive drive valve type pump through a header rifle drilled in the crankcase to the three bronze bushings support-

NEW HOLLAND

brings New Low Costs to Producers



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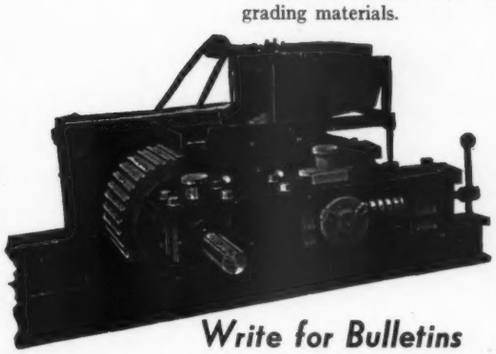
with the New Holland heavy-duty CIRCLE-THROW Screen. Balanced vibration—rubber mountings—100% safety factor in rotary mechanism—are a few of the many advanced features that insure greater capacity and uniformity in grading materials.

Faster Crushing

with the New Holland ROLL CRUSHER which is equipped with a new type pulsating feeder that doubles the usual capacity. Built in a wide range of sizes for all commercial capacities, up to 100 tons per hour. Specify this extra rugged crusher for your toughest crushing jobs.



Write for Bulletins

NEW HOLLAND MACHINE CO., New Holland, Pa.

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LONG RANGE MACHINES

Sauerman Drag Scraper making a circular cut 300 ft. wide in a hill of gravel.

WHEREVER there is a problem of excavating from pit, bank or river, stock piling or other material-handling work involving hauls of any distance from 100 to 1500 ft.—it pays to find out what a Sauerman Slackline or Drag Scraper will do and what it will cost. In a great many cases, a Sauerman machine shows a saving in comparison with any other equipment that will dig and haul an equal yardage.

Write for Catalog.

SAUERMAN BROS.
434 S. Clinton St. Chicago, Ill.

SECO

Patented

The only vibrating screen with a POSITIVELY CONTROLLED circular motion.

IT DOES A BETTER JOB!

SCREEN EQUIPMENT CO.
9 Lafayette Ave. Buffalo, N. Y.

ing the camshaft and to the auxiliary shafts and timing gears. A "flat" ground in the camshaft acts as a distributing valve and releases the oil under pressure to connecting-rod crank pin jets, which direct an intermittent oil stream into counter-sunk feed holes drilled in the large end of each connecting rod. Pistons, cylinders, valve tappets and main bearings are oiled by crankcase mist.

Unlike other small engines, the Meteor Four employs a gear driven centrifugal water pump which assures adequate cooling under all conditions of load and temperature. The porting and baffling in the cylinder block and head are so designed that sufficient velocity and volume of cooling water are maintained at the sensitive valve seat and combustion chamber spots. These surfaces are continuously scoured and kept free to prevent overheating.

• Excavator

The Hanson Excavator Works, crane-and-shovel division of the Hanson Clutch & Machinery Co. of Tiffin, O., have in production a new ⅜-cu.yd. excavator named the "Comet" available in any combination of a shovel, crane, clamshell, drag-line, pile-driver or trench-hoe.

The "Comet," a full revolving machine, is mounted on an electric-welded steel lower base or frame of the most sturdy and rigid design. Crawler frames are heavily webbed and equipped with countersunk Zerk fittings for perfect lubrication. The crawlers are oversize in comparison to the weight of the machine

The new full-revolving machine.

thereby giving ease of travel and operation. The upper turret frame carries the machinery on a perfectly designed ring gear revolving on sturdy rollers of the Hanson multiple-hook type requiring no center-pin adjustment at any time.

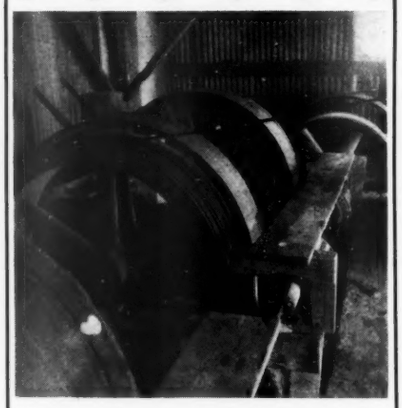
All shafts on upper deck are mounted on roller bearings. Each shaft is so mounted that the removal of one may be made without disturbing any other. All clutches are of the expansion, double-shoe type and have independent hydraulic control. The shoes in the clutches and brakes may be relined without dismantling the shafts.

The "Comet," baby of the Hanson family, weighs approximately 20,000 lb. but is built with the same exclusive 100 per cent. independent control features as all other Hanson heavier machines. It is possible to crowd, hoist, swing, propel and raise the boom simultaneously. The "Comet" is offered with either chain or cable crowd and is powered at option of the purchaser with either a Ford V-8 or Hercules 6-cyl. engine.

• Admixtures

Volsonite Enterprises, Ltd., of Pasadena, Cal., is marketing a line of waterproofing compounds for use in concrete that is finding ready acceptance in many localities.

MADDOX



HOISTS

This modern plant of the Williston Shell Rock Co., Newberry, Fla., is Maddox-equipped with a complete complement of Maddox Roll Crushers, Pit Cars and Hoisting Equipment. Write for Maddox bulletins on Revolving Screens, Vibrating Screens, Log Washers and Dredging Machinery.

MADDOX FOUNDRY AND MACHINE WORKS
Archer Florida

DO NOT TOLERATE
DUST
IT COSTS MONEY

DRACCO ENGINEERS
have over 20 years experience
CONTROLLING DUST
Write Them

DRACCO CORPORATION
4077 E. 116th Street
CLEVELAND, - - OHIO

Dodge truck loading up a delivery of sand in Detroit. Mich. Operated by the Standard Building Products Co., the truck is one of eight pieces of equipment which hauls sand, gravel and cement blocks on an average of approximately 280 mi. a day. Aggregates, purchased from the Troy Aggregate Corp., are utilized by the Standard company in the manufacture of a wide variety of concrete products.

The Portland Cement Ass'n is authority for the rule that less than two and one-half gallons of water are sufficient to hydrate one sack of Portland cement. The water used in excess of two and one-half gallons reduces the strength of the cement paste, but in practice an excess is ordinarily required to make the mix workable.

The addition of such a material as Volsonite waterproofing in any one of its various forms is of great practical value because such addition densifies the mixture, increases the workability, flowability and waterproofness.

This allows (1) a reduction in the water-cement ratio and so brings the mix to ideal strength conditions, or (2) if surplus mixing water is used, makes easier the placing of concrete through chutes and around reinforcing.

By the addition of Volsonite, with a low water-cement ratio and proper curing, concrete is produced with a minimum of voids. This is true, not only of concrete, but of all Portland cement mixtures.

The company also makes concrete hardeners and technical paints and is reported to be accepting applications from prospective distributors for its products.

Traffic *(from page 68)*

can authorize the carrier to take such action should the carrier desire to do so. Examiner Fuller said that this view of the law could not be sustained and that under the act as it now stands the shippers must pay and the carriers must collect the legally-established rates unless the commission found the rates in excess of reasonable maxima. He said that otherwise the law would operate against the interest of shippers and carriers generally by restoring to a large extent that very indefiniteness and uncertainty which the interstate commerce act was designed to remove. I. C. C. Docket No. 27,952 Missouri Gravel Co. *et al v.* Burlington, and sub No. 1, Same *v.* Same.

In another case involving sand and gravel Examiner Burton Fuller recommends that the commission find the charges made up of the defendants' line haul rate of 70 c. a ton, plus the Illinois Centrals switching charge of $4.95 a car collected on sand and gravel from Attica, Ind. to Champaign, Ill., on shipments moving between Mar. 22, 1935 and Jan. 14, 1936, unreasonable to the extent that the defendant failed to provide for the absorption of the switching charge out of its line-haul rate. He proposes an award of reparation of $59.40, with interest.—I. C. C. Docket No. 28,108 Neal Gravel Co. *v.* Wabash.

PYRASTEEL feed pipe

Many cement mills find that PYRASTEEL gives them unexcelled service not only in feed pipes, but for kiln ends, drag chains, cooling equipment, clinker buckets, or wherever temperatures exceed 1400° F.

CHICAGO STEEL FOUNDRY CO.
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Rubber Cushioned P-O-W-E-R

. . . that puts the "kick" in the right spot. Resilient rubber mountings support the screen corners so that the positive gyrating action of the SIMPLICITY is confined to the screen decks and not lost in the framework. Result is less structural wear and greater screening efficiency.

Double Deck Model "SS" . . . one of 12 standard sizes available in Simplicity Screens with single, double and triple deck, as well as tandem combinations. Write for Bulletin.

Simplicity Gyrating Screens have many other advantages: Durable construction, Perfect balance, Positive action, Extra capacity, and Freedom from blinding.

SIMPLICITY ENGINEERING COMPANY
DURAND - - - MICHIGAN

Cuts Hauling & Dumping Costs

The Brooks LOAD LUGGER

PATENTED & PATENTS PENDING

Don't overlook the cost-cutting possibilities of the Brooks Load-Lugger. It's the most practical, fool-proof, and greatest cost-cutting method known, for hauling and dumping any material where loading is done by hand. One truck with a "litter" of bodies . . . is the Load-Lugger way. Made in four capacities, shipped assembled, ready for installation on any truck chassis in a few hours.

ONE MAN OPERATED from driver's seat. No sheaves, cables, or "gadgets" to worry with. Buckets rest directly on chassis, no suspended load. Its speed and performance is almost unbelievable. For complete details and prices write the manufacturers. Demonstrations arranged in most sections.

BROOKS EQUIPMENT & MFG., CO.
58 Davenport Road Knoxville, Tenn.

Asphaltic Sandstone.—New rates and reparation are sought on alleged violation of Sec. 1, 3 and 6 in connection with the shipment of processed asphaltic sandstone from Bowling Green, Ky. to Harrisburg, Pa., with the alleged preference shown to shippers of bituminous rock in a complaint filed by B. A. Ward, 711 Marion E. Taylor Bldg., Louisville, Ky., in I. C. C. Docket No. 28,084 Kentucky Rock Asphalt Co., Inc., Louisville, Ky. *v.* L. & N. *et al.*

Sand and Gravel.—The commission has suspended certain schedules in Supplements 183 and 184 to Alternate Agent F. D. Miller's I. C. C. No. 1,635, proposing to cancel routing in connection with the Southern Railway on sand and gravel and related articles in carloads from points on the Atlantic Coast Line Railroad to destinations on the Charleston & Western Carolina Railway, the Columbia, Newberry and Laurens and the Clinchfield Railroads which would result in the application of higher combination rates, in I & S Docket No. 4,520.

Trade Literature

Air-Operated Combustion Control. 32 p. Bailey Meter Co., Cleveland, O.

Acid and Chemical Pumps. 4 p. Lawrence Machine & Pump Corp., Lawrence, Mass.

The JA-35 Jackhamer. 8 p. Ingersoll-Rand Co., New York, N. Y.

Rock-Bottom Costs for Stripping, Quarrying and Aggregates. 8 p. R. G. Le Tourneau, Inc., Peoria, Ill.

Fuller Inclined-Grate Cooler. 4 p. Fuller Co., Catasauqua, Pa.

The General 341—a ¾ Yard Excavator. 6 p. General Excavator Co., Marion, O.

The Right Jackson Vibrator for Your Job. 96 p. Electric Tamper & Equipment Co., Ludington, Mich.

Massco Model 38 Rock Bit Grinder. (folder). *Massco Bit Carrier System.* (folder). Mine & Smelter Supply Co., Denver, Colo.

Industrial Railway Cars. 16 p. Pressed Steel Car Co., Inc., Pittsburgh, Pa.

The Risco Packer. 8 p. Richardson Scale Co., Clifton, N. J.

Advance Information on Jaeger 1939 Model Truck Mixers. (folder). Jaeger Machine Co., Columbus, O.

Type "U" De-Ion Air Circuit Breaker. 12 p. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Thermit Welding. 34 p. Metal & Thermit Corp., New York, N. Y.

Austin-Western 5-Yard Tractor Scraper. 8 p. *Twelve-Yard Hydraulic Scraper and Giant Ripper.* 8 p. Austin-Western Road Machinery Co., Aurora, Ill.

"SSU" Unit Pumps. 32 p. *Allis-Chalmers Pulverators.* 16 p. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Sta-Put Rock Drill Lubricants. (4 p.) E. F. Houghton & Co., Philadelphia, Pa.

Multi-Impact Pulverators. (16 p.); *Machinery for Complete Crushing Plants.* (32 p.); *Rod Mills* (20 p.) Allis-Chalmers Mfg. Co., Milwaukee, Wis.

A Story of Faith that Led to Fortune (20 p.) Lincoln Electric Co., Cleveland, O.

Four-Cylinder Diesel Engines. (4 p.) Hercules Motors Corp., Canton, O.

Raymond Laboratory Mill. (4 p.) Raymond Pulverizer Div., Combustion Engineering Co., Chicago, Ill.

Material Handling Systems. (16 p.) Gifford-Wood Co., New York, N. Y.

Automatic Precision Batching by Weight. (12 p.) Buffalo Scale Co., Buffalo, N. Y.

Stop Foot Injuries. (32 p.) Lehigh Safety Shoe Co., Allentown, Pa.

A Completely Modern Diesel. (16 p.) Chicago Pneumatic Tool Co., New York, N. Y.

Clyde Whirleys. (24 p.) Clyde Iron Wks., Duluth, Minn.

The Improved Centri-Merge Wet Dust Collector. (4 p.) W. W. Sly Mfg. Co., Cleveland, O.

Reeves Variable Speed Control. (122 p.) Reeves Pulley Co., Columbus, Ind.

INCORPORATIONS

Calcium Products Co., Grants Pass, Ore. Capital, $25,000. Incorporators: Glenn C. Hunter, J. W. Mays and others.

Natural Sand & Gravel Co., Millville, N. J. Capital, $50,000. Henry S. Silverman, agent.

Carolina Phosphate Products Corp., Charleston, N. C. Capital, $10,000. Incorporators: E. H. Hutchinson and Lionel K. Legge.

Carter Rock & Sand Corp., Miami, Fla. 50 shares $100 par value. Incorporators: C. R. Carter, C. L. Carter and J. J. Brown.

Cement Products & Supply Co., Lakeland, Fla. 100 shares $100 par value. Incorporators: H. B. Zimmerman, C. W. Zimmerman and F. M. Zimmerman.

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...The Pipe with the Continuous Expansion Joint

NOT OBTAINABLE *in any other pipe!*

Sizes 4" to 30" with all types of fittings and connections. Complete fabrication service.

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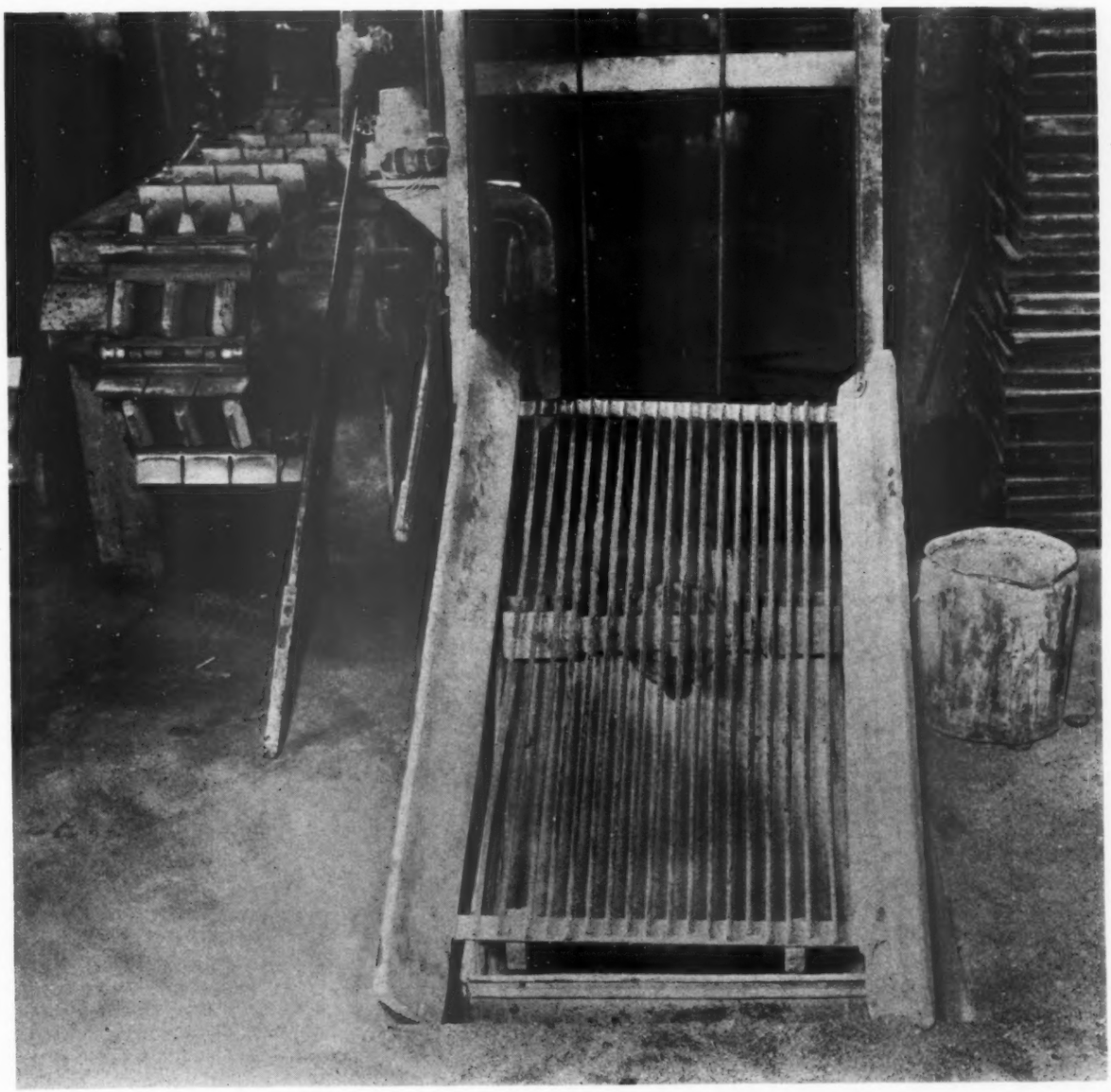
PROFITABLE NEW PRODUCTS



Concrete-brick machine and grizzly over batching hopper at plant of LaPorte Cement Products Co. (Story on p. 76)

By W. E. TRAUFFER

SUPPLYING A CITY'S CONCRETE DEMAND

MUCH of the concrete used in Jacksonville, Fla., in various forms is produced by a combination of plants with an unusually wide variety of products. The Hedrick & Whitney Co., manufacturing ready-mixed concrete, forms the nucleus of the group and also owns the Cash Building Material Co. which handles lime, cement, plaster, brick, sand, gravel, etc. This firm also has an interest in the Jackson Concrete Works, which produces concrete block. On the same property is the James Greig Stone Works, which manufacturers all varieties of architectural concrete stone. This firm is just completing a large contract for stone for a large school in Tallahassee, Fla., for which each piece is made to the architect's specifications.

The Hedrick & Whitney Co. went into the ready-mixed-concrete business about 10 years ago, using dump trucks for making deliveries. Early in 1937 a 1½-cu.yd. Ransome truck-mixer was purchased and later in the year a second unit was added. Both these machines are used as 2-cu.yd. agitators. A Jaeger non-tilting mixer is used to charge the trucks.

The office of Hedrick & Whitney, Inc., with the row of plants in background. Also evident are many of the various products.

The concrete central-mixing plant, consisting of a mixer and hoist, loading one of the truck-mixers.

All these operations are in a row along a railroad siding over which aggregates, cement, etc., are received. Aggregates are unloaded by hand into bins serving the concrete mixers, the block machines and all other operations.

Most of the concrete being sold goes to F. H. A. home-building and improvement projects. The company also does subcontracting of concrete for larger construction projects. Some of these are served from the plant but in others a mixer is placed on the job. A profitable side line has been developed by the company in the preparation for sale of the concrete floors, walls, etc., which it is sometimes necessary to tear out on a rebuilding job. The broken concrete is run through a small Universal crusher and the product is sold for filter beds and for absorption beds for septic tanks.

MAKES DEPRESSION-BORN BUSINESS PAY

ANY company which started business in 1929 and managed to survive and even expand during the depression that followed must have something "on the ball." This is the case with the firm of Burnup & Sims, West Palm Beach, Fla., which entered the building-supply business in that year. In 1930 the company began retailing aggregates and in 1934 installed equipment for the manufacture of concrete blocks and tiles. In March, 1937 it put into operation a new ready-mixed-concrete plant and two truck-mixers. A third mixer was added in September of the same year. The company is also in the building business. Lots are purchased and houses designed and built.

A very good block business has been built up. The product is used for commercial and private dwellings, warehouses, filling stations, etc., and in these structures is used for all the walks and foundations. In most cases a finish coat of stucco is applied to the building. All the items of the company's line are sold direct, except ready-mixed concrete and concrete blocks. These two products are sold through local lumber yards. Most of the concrete produced has been used in residential construction in Palm Beach and West Palm Beach, city sidewalks, etc. All the concrete produced is certified by the H. C. Nutting Laboratories.

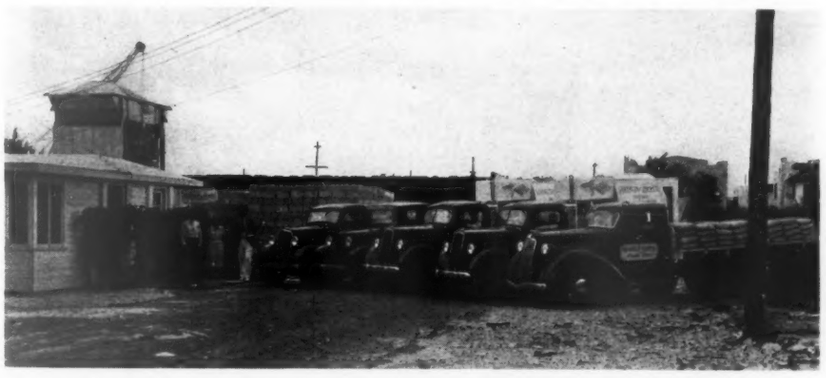
The plants are located on the main line of the Florida East Coast Ry. over which rock is received from Naranja. Beach sand and local white sand are brought in by trucks. Different users prefer one or the other of these sands, but for the best concrete the two are mixed. Cement in bags is unloaded from trucks on an earth-fill ramp into the concrete-plant storehouse.

A P & H gasoline crawler crane with a 1-cu.yd. clam-shell bucket is used to unload the stone from the cars to the stock-piles or bins and to transfer the sand and stone from the stock-piles to the bins. Aggregates are stored in a 110-ton Blaw-Knox 3-compartment bin and are weighed in a 3-compartment Blaw-Knox weighing batcher with a 3-beam scale. The batched aggregates are discharged through a chute into the truck-mixers, and the required amount of cement is dumped from sacks into the same chute.

In loading the 2-cu.yd. Blaw-Knox truck-mixers 1 cubic yard of aggregates is first put in, then the required amount of cement, followed by another cubic yard of aggregates and the required amount of cement. In spite of this dou-

(Continued on page 77)

The mixer and one of the block machines with tampers above.



The Burnup & Sims fleet of trucks lined up in front of the company's office.

One of the truck mixers discharging concrete direct to the forms at a Palm Beach construction project.

PROFITABLE NEW PRODUCTS

WASTE AGGREGATE YIELDS A PROFIT

ABOVE—Plant and part of outdoor-storage yard of the La Porte Cement Products Co.

LEFT—Inside view showing the hoist and elevated mixer.

By HARRY F. UTLEY

FOR a score of years Sherman Cumerford of La Porte, Ind., had been engaged in the production of sand and gravel, largely for use by his county's highway department. Operations had been carried on at various locations as there were no extensive deposits in that area and those that had been worked contained considerable amounts of waste material which were piled and abandoned. In casting about for a market for this sand and small gravel Mr. Cumerford last year formed the La Porte Cement Products Co. for the manufacture of concrete bricks and blocks in which he has attained considerable success.

North of the city a brick building, which formerly housed the power-plant serving an interurban railway which ceased operating a few years ago, was acquired, alterations made and machinery installed. Since raw materials are obtained at extremely low cost, the location of the plant away from a source of supply is no handicap.

Sand and gravel are brought in by the company's Diamond T dump truck, fitted with an Edwards Iron Works body and Gar Wood hoist, and are dumped directly on the concrete floor of the plant. Batches are proportioned in a skip bucket which discharges into the mixer on a platform above where the water is added, being under meter control of the man operating the batcher on the main floor.

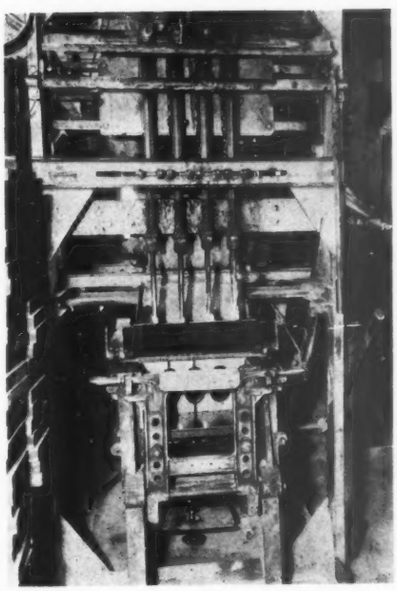
Bricks are produced on a standard Dunbrik machine which, together with the mixer and skip are a part of the line-production facilities supplied by the W. E. Dunn Mfg. Co. of Holland, Mich. Selective chutes from the mixer also supply concrete to either of two tampers when concrete blocks are being made. One of these was furnished by the Concrete Machinery Co., a Dunn subsidiary; the other is a Universal machine.

High-early-strength cement is used exclusively in the production of all units to speed up the curing time. Bricks are removed from the pallets the next day after they come from the machine and are ready for shipment usually in about a week. Common and solid-color bricks are turned out regularly and color-faced units are made to special order. Standard Dunn colors are added to the mix when the batches are made up.

The solid-color bricks have found their way into a large number of residences and Mr. Cumerford has taken photographs of many of them for use in promoting the sale of his product. With colored units selling for around $18 per thousand and common bricks at about $12, the company is able to compete easily with clay bricks in both face and common styles and still realize a satisfactory profit. Panels showing the various colors and mortar combinations are on display at the plant and

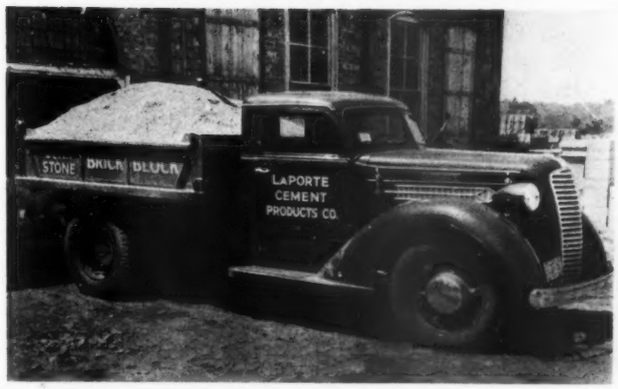
The "heart" of the plant is this concrete-brick machine.

sample units may be examined at various building-material dealers' showrooms in La Porte and neighboring communities.



One of the tampers used for producing regulation-size concrete blocks.

Mr. Cumerford's most recent effort to promote the sale of concrete bricks was an attractive exhibit which was on display before thousands of visitors who attended the La Porte County Fair during the last week in August.



Dump truck arriving with a load of sand.

Burnup-Sims *(from page 75)*

ble work a truck-mixer can be loaded in 1½ min. Water is measured in a 135-gal. drum with a water glass gage and is discharged into the mixer drums through a 4-in. pipe. The tanks on the truck-mixers are always kept full. Exactly 10 gal. of water from this tank is measured into the mixer drum after the contents have been delivered and this water is used to wash the drum on the return trip to the plant. The wash-water is retained in the drum and used in the next batch.

With the three 2-cu.yd. Blaw-Knox truck-mixers the plant easily produces 80 cu.yd. of concrete daily. The aver-

The ready-mixed concrete plant. Cement is delivered up the ramp at the left.

age haul is 5 mi., although hauls as long as 23 mi. have been made. The truck-mixer drums are mounted on Ford V8 chassis are independently driven by Hercules gasoline engines. In addition to these trucks the company owns three dump trucks for delivering aggregates and a flat truck for cement.

The aggregates for the block plant are loaded with hand shovels from piles into wheel-barrows with Goodyear pneumatic tires. These feed the Blystone 11-cu. ft. blade-mixer. The concrete is dumped on the floor and shoveled into the Stearns hand-operated stripper, which is used in connection with an Anchor tamper driven by an electric motor. Concrete drain tiles are made in hand molds.

There is also a hand-operated machine for making 4-in. by 5-in. by 10-in. bricks. A single order for 30,000 of these bricks was recently filled for the construction of a Mexican style tourist court. This machine is used in connection with another Anchor tamper. A Colorcrete spray gun is used to color these bricks on the job after they are in place. This colors not only the surface of the bricks, but the mortar as well, giving the solid color effect which is in favor in that section.

HOW TO MAKE
MORE $$$$$
in Concrete Blocks

Ask for this Booklet

It tells you all about modern methods of concrete block making with the latest equipment — Multiplex Super Tamper, and new type Multi-Mixer and other machines with capacities from 400 to 3600 units per day.

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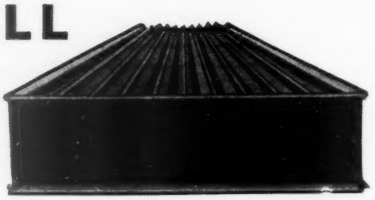
CONCRETE MACHINERY CO.
ELMORE, OHIO

EASY TO MAKE EASY TO SELL

Concrete Joists

R & L "Crescent" Ten-Gang Joist Mold



For you aggregate men who are looking for a profitable side line with a ready market . . . there is a big opportunity at small investment in the R & L Concrete Joist Machine. The building industry is "sold on" concrete joists . . . it's just a matter of taking orders for a proved product.

R & L *Write for Bulletin and full details*

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We also manufacture Pipe Molds and Machines, Tile Forms and Vibrating Tables

The Popular Choice

Ask for CATALOG No. 1582

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because they do your concrete mixing jobs faster, better and more accurately, insuring high strength concrete of maximum workability. Their ease of control and speed of operation mean more trips and extra profits.

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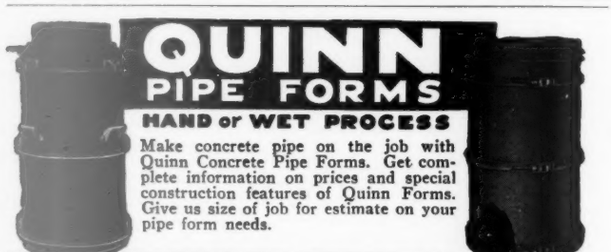

QUINN PIPE FORMS
HAND or WET PROCESS

Make concrete pipe on the job with Quinn Concrete Pipe Forms. Get complete information on prices and special construction features of Quinn Forms. Give us size of job for estimate on your pipe form needs.

HEAVY DUTY
Built for more years of service—sizes for any diameter pipe from 12 to 84 inches—any length—tongue and groove or bell end.

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Makes same sizes pipe as "Heavy Duty" but built to meet demand for lower cost equipment to produce uniform quality in smaller amounts.

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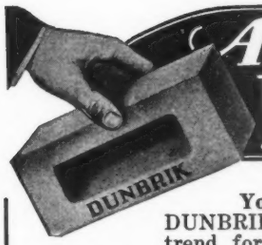

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Aggressive producers like Riverside Sand & Gravel Co., Thiensville, Wis.—Consolidated Rock Products Co., Brooksville, Fla.—W. P. Rose, Goldsboro, N. C.—Consolidated Quarries of Georgia—Georgia Mineral Products Co., Tate, Ga.—are converting their surplus sand into profits. Aggregate made into these modern units sells up to $12.00 per ton.

We furnish the machine. You make the products for your territory. Send for "4 Keys to Manufacturing Success" and learn how these DUNBRIK Manufacturers are making outstanding progress—This exclusive business offers unlimited opportunity for growth.

W. E. DUNN MFG. CO.
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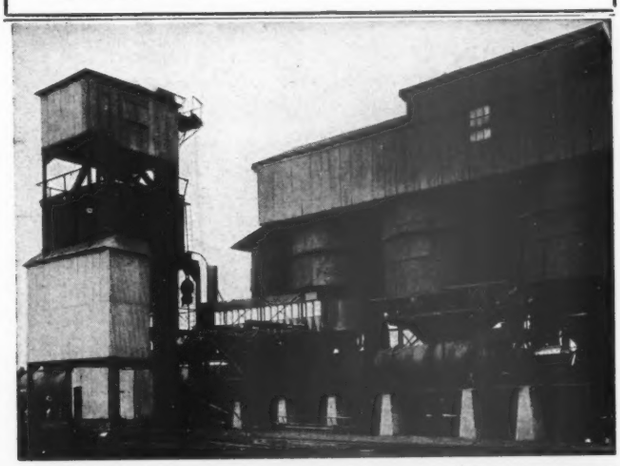

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HOT MIX —— COLD MIX
— OR —
COMBINATION UNIT FOR BOTH TYPES
CAPACITY DESIGN AND ARRANGEMENT TO MEET ANY REQUIREMENTS

Designed and Built
—— By ——
WARREN BROTHERS ROADS CO.
P. O. BOX 1869
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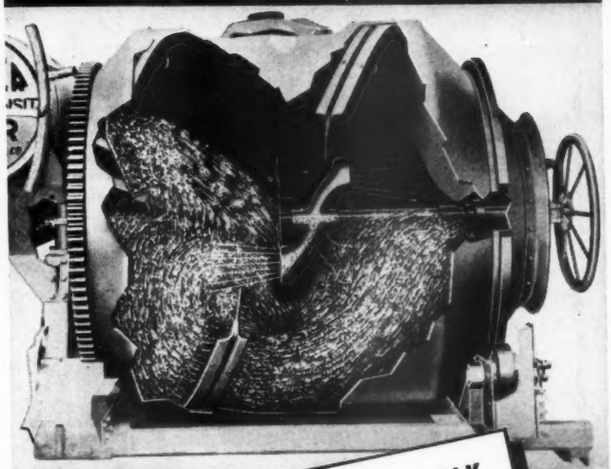
They're Buying Jaegers because

JAEGER ALONE Builds This MODERN TRUCK MIXER....



SYPHO-METER WATER TANK 1.
Accurate within a fractional per cent of tank capacity **regardless of tank position or splashing on roughest roads**—a 1939 improvement.

DUAL REVOLVING WATER SPRAYS 2.
100% faster, uniform water distribution—clear path as they revolve, spray **into and over mass in both directions, from end to end of drum**—insure thoro mix even on shortest hauls—a 1939 improvement.

MORE SALABLE CONCRETE 3.
Jaeger Reversing End-to-End Mix, plus accurate measurement and more rapid and uniform distribution of water, produce recognized higher strength concrete, give Jaeger operators a basic sales advantage. Bulletin TM-39 gives up-to-the-minute information. Send for your copy.

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602 Dublin Ave. Columbus, Ohio

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Agitators, Thickeners and Slurry Mixers
*Traylor Engr. & Mfg. Co.

Air Compressors (Portable)
*Chicago Pneumatic Tool Co.

Air Compressors (Stationary)
*Chicago Pneumatic Tool Co.
Fuller Company

Air Filters
*Blaw-Knox Co.
Buell Engineering Co.
*Dracco Corp.
*Parsons Engineering Corp.
*Western Precipitation Corp.

Air Separators
*Gruendler Crusher & Pulverizer Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
Sturtevant Mill Co.
*Williams Patent Crusher & Pulverizer Co.

Alloys (Steel)
Chicago Steel Fdry. Co.
Manganese Steel Forge Co.
Stulz-Sickles Co.

Ash and Refuse Handling Equipment
Allen-Sherman-Hoff Co.
*Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Asphalt Mixing Plants
Hetherington & Berner, Inc.
*Warren Brothers Roads Co.

Automatic Feeders
*Fuller Company
*Link-Belt Co.

Automatic Weighers
*Blaw-Knox Co.
*Fuller Company
*Jaeger Machine Co.

Backfillers
*Bucyrus-Erie Co.
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Balls (Grinding)
*Kennedy-Van Saun Mfg. and Eng. Corp.
Manganese Steel Forge Co.
*Traylor Engr. & Mfg. Co.

Balls (Tube-Mill, etc.)
*Allis-Chalmers Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Manganese Steel Forge Co.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Barges (Steel)
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Bearings (Anti-Friction)
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Robins Conveying Belt Co.
*Sprout, Waldron & Co.
Timken Roller Bearing Co.

Bearings (Roller)
Timken Roller Bearing Co.

Belt Fasteners
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Belt Lacings
Armstrong-Bray & Company
Flexible Steel Lacing Co.

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*Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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Goodyear Tire & Rubber Co.

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Goodyear Tire & Rubber Co.

Bin Gates
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*Allis-Chalmers Mfg. Co.
*Fuller Company
*Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
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Manganese Steel Forge Co.
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*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Bins (Cast Iron)
Allen-Sherman-Hoff Co.

Bins (Steel)
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*Hendrick Mfg. Co.
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*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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*Chicago Pneumatic Tool Co.

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Block Machines (Concrete)
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Multiplex Concrete Machinery Co.

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Dunn Mfg. Co., W. E.
Multiplex Concrete Machinery Co.
R & L Concrete Machinery Co.

Blocks (Pillow)
Maddox Fdry. & Machine Works

Blocks (Sheave)
*Haiss Mfg. Co., Geo.
*Sauerman Bros., Inc.
*Sprout, Waldron & Co.

Blowers
Buell Engineering Co.

Bodies (Dump Truck)
*Easton Car & Construction Co.

Bodies (Motor Truck, Concrete Mixing)
*Blaw-Knox Co.
Jaeger Machine Co.

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Borings (Core)
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Pennsylvania Drilling Co.

Brick Machines (Concrete)
Dunn Mfg. Co., W. E.
R & L Concrete Machinery Co.

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*Tyler Co., W. S.

Bucket Elevators (See Conveyors and Elevators)

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*Blaw-Knox Co.
*Haiss Mfg. Co., Geo.
*Link-Belt Co.
Owen Bucket Co.
Wellman Engineering Co.

Buckets (Dragline—Cableway)
*Bucyrus-Erie Co.
*Link-Belt Co.
*Sauerman Bros., Inc.
Wellman Engineering Co.

Buckets (Dump)
*Brooks Equip. & Mfg. Co.
*Dempster Bros. Inc.
*Jaeger Machine Co.

Buckets (Elec. Heated, Weighing)
*Easton Car & Construction Co.

Buckets (Elevator and Conveyor)
Chicago Steel Fdry. Co.
*Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Buggies (Dump)
*Koehring Co.

Bulk-Cement Storage Plants
*Sprout, Waldron & Co.

Bushings
Maddox Fdry. & Machine Works

Cableways
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*Link-Belt Co.
*Sauerman Bros., Inc.

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Wellman Engineering Co.

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Gilmore Wire Rope Div. of Jones & Laughlin Steel Corp.
*Link-Belt Co.
Maddox Fdry. & Machine Works

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Carriers
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Carryalls
*Koehring Co.

Cars (Block, Concrete)
Multiplex Concrete Machinery Co.

Cars (Industrial)
*Easton Car & Construction Co.

Cars (Quarry and Gravel Pit)
Maddox Fdry. & Machine Works
Sanford-Day Iron Works

Castings
Chicago Steel Fdry. Co.
*Eagle Iron Works
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*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Maddox Fdry. & Machine Works
McLanahan & Stone Corp.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

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Central Concrete Mixing Plants (Conrp.)
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*Sprout, Waldron & Co.

Chain (Dredge and Shovel)
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Chain Drives
*Link-Belt Co.

Chain (Elevating and Conveying)
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*Jeffrey Mfg. Co.
*Link-Belt Co.
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*Sprout, Waldron & Co.

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*Hendrick Mfg. Co.
*Link-Belt Co.
Maddox Fdry. & Machine Works
Manganese Steel Forge Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.

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*Deister Machine Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
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*Nordberg Mfg. Co.
Simplicity Engr. Co.
Sturtevant Mill Co.

Clips (Wire Rope)
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Leschen & Sons Rope Co., A.

Clutches
*Link-Belt Co.
*Sprout, Waldron & Co.

Coal-Pulverizing Equipment
*Allis-Chalmers Mfg. Co.
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*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Compressors (See Air Compressors)

Concentrators (Slurry)
*Deister Concentrator Co.

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*Chicago Pneumatic Tool Co.

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*Blaw-Knox Co.
*Jaeger Machine Co.
*Koehring Co.

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*Koehring Co.

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230 Sold to 184 Operators

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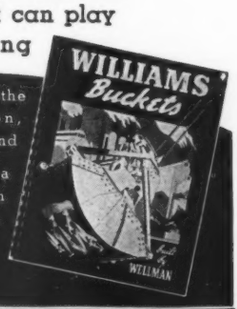
Built to Last . . . and Move Dirt Fast!

No "dead-head" metal rides in Williams Buckets—you swing pay loads, not inert metal! The special welded construction of Williams Buckets eliminates excess weight—makes them stronger, and more enduring. Williams Buckets are powerful diggers. They bite full loads smoothly and easily, open quickly and dump cleanly. A Williams Bucket can play a big part in making excavating or material handling more profitable.

Distributors located in all parts of the country are competent to render valuable field service.



Tell us the condition, and we'll send you **FREE**, a special bulletin describing the specific Williams Bucket best fitted to the job.

THE WELLMAN ENGINEERING COMPANY
7014 CENTRAL AVENUE • CLEVELAND, OHIO

built by WELLMAN . . .

WHITCOMB LOCOMOTIVES

GO TO

DUTCH GUIANA JUNGLES

This is one of two new model, 6-ton, Diesel-powered Whitcomb Locomotives recently shipped to Dutch Guiana Mines in the heart of the jungles. The track system for this operation is of necessity very temporary in nature. The heat and humidity reaches a point seldom, if ever, experienced in the United States. Notwithstanding the unusual conditions, these locomotives will be manned by natives, which is a tribute to Whitcomb simplicity and dependability. Whitcomb Locomotives of 18-ton capacity will be used to haul ore to the mill.

For over 65 years, Whitcomb Locomotives have been doing tough haulage jobs efficiently and economically. Find out how Whitcomb haulage will save you expense. Let our engineers survey your needs and make recommendations without obligation.

A TYPE OF POWER TO SUIT EVERY NEED

Gasoline or Diesel Mechanical Drive
Gasoline or Diesel Electric Drive
Electric Storage Battery
Electric Trolley

THE WHITCOMB LOCOMOTIVE COMPANY
Plant at Rochelle, Illinois
Subsidiary of The Baldwin Locomotive Works. All sales made by The Baldwin Locomotive Works, Paschall Station Post Office, Philadelphia, Pennsylvania.

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Smith Engr. Works
***Sprout, Waldron & Co.**
Sturtevant Mill Co.

Conveyors (Pneumatic)
***Dracco Corp.**
***Fuller Company**

Conveyors (Ready-Mixed Concrete)
***Blaw-Knox Co.**
***Haiss Mfg. Co., Geo.**
***Jaeger Machine Co.**
***Link-Belt Co.**
***Robins Conveying Belt Co.**

Coolers (Clinker)
***Fuller Co.**
***Smidth & Co., F. L.**
***Traylor Engr. & Mfg. Co.**

Coolers (See Kilns and Coolers—Rotary)

Correcting Basins
***Smidth & Co., F. L.**

Couplings (Flexible and Shaft)
Erie Pump & Engine Works
***Link-Belt Co.**
Maddox Fdry. & Machine Works
***Robins Conveying Belt Co.**
***Sprout, Waldron & Co.**

Couplings (Hose)
***Chicago Pneumatic Tool Co.**

Cranes (Crawler and Locomotive)
***Bay City Shovels, Inc.**
***Bucyrus-Erie Co.**
***Koehring Co.**
***Link-Belt Co.**
Thew Shovel Co.

Crusher Parts
***American Pulverizer Co.**
***Kennedy-Van Saun Mfg. and Eng. Corp.**
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
***Traylor Engr. & Mfg. Co.**

Crushers (Cone)
***Nordberg Mfg. Co.**

Crushers (Hammer)
***Allis-Chalmers Mfg. Co.**
***American Pulverizer Co.**
***Brooks Equip. & Mfg. Co.**
***Gruendler Crusher & Pulverizer Co.**
***Kennedy-Van Saun Mfg. and Eng. Corp.**
Sturtevant Mill Co.
***Williams Patent Crusher & Pulverizer Co.**

Crushers (Jaw and Gyratory)
***Allis-Chalmers Mfg. Co.**
Bacon, Inc., Earle C.
Brooks Equip. & Mfg. Co.
***Gruendler Crusher & Pulverizer Co.**
***Kennedy-Van Saun Mfg. and Eng. Corp.**
Lewistown Foundry & Machine Co.
New Holland Machine Co.
***Nordberg Mfg. Co.**
Smith Engr. Works
***Traylor Engr. & Mfg. Co.**

Crushers (Ring)
***American Pulverizer Co.**
***Williams Patent Crusher & Pulverizer Co.**

Crushers (Roll)
***Allis-Chalmers Mfg. Co.**
***American Pulverizer Co.**
***Brooks Equip. & Mfg. Co.**
***Gruendler Crusher & Pulverizer Co.**
***Jeffrey Mfg. Co.**
***Kennedy-Van Saun Mfg. and Eng. Corp.**
***Link-Belt Co.**
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
New Holland Machine Co.
***Robins Conveying Belt Co.**
***Williams Patent Crusher & Pulverizer Co.**

Crushers (Rotary)
***Allis-Chalmers Mfg. Co.**
***American Pulverizer Co.**
New Holland Machine Co.
***Williams Patent Crusher & Pulverizer Co.**

Crushing Rolls
***Allis-Chalmers Mfg. Co.**
***Kennedy-Van Saun Mfg. and Eng. Corp.**
***Link-Belt Co.**
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
New Holland Machine Co.
Sturtevant Mill Co.
***Traylor Engr. & Mfg. Co.**
***Williams Patent Crusher & Pulverizer Co.**

Cutter Heads (Dredging)
***Eagle Iron Works**
Maddox Fdry. & Machine Works

Diesel Engines (See Engines—Diesel)

Dippers and Teeth (Power Shovel)
***Bucyrus-Erie Co.**
***Koehring Co.**

Dragline Cableway Excavators
***Bucyrus-Erie Co.**
***Link-Belt Co.**
***Sauerman Bros., Inc.**

Dragline Excavators
***Bay City Shovels, Inc.**
***Bucyrus-Erie Co.**
***Koehring Co.**
***Link-Belt Co.**
Thew Shovel Co.

Draglines (Walking)
***Bucyrus-Monighan Co.**

Dredges
***Bucyrus-Erie Co.**
Hetherington & Berner, Inc.
Maddox Fdry. & Machine Works
***Morris Machine Works**

Drill Bit Reconditioning
***Bucyrus-Erie Co.**

Drill Bits
***Chicago Pneumatic Tool Co.**

Drill Steel
***Chicago Pneumatic Tool Co.**

Drilling Accessories
***Bucyrus-Erie Co.**
***Chicago Pneumatic Tool Co.**
Timken Roller Bearing Co.

Drilling Contractors
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Blast-Hole)
***Bucyrus-Erie Co.**
***Chicago Pneumatic Tool Co.**

Drills (Core)
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

* See also information in the 1938 Pit and Quarry HANDBOOK.

Drills (Diamond)
*Chicago Pneumatic Tool Co.
Hoffman Bros. Drilling Co.
Pennsylvania Drilling Co.

Drills (Drifting)
*Chicago Pneumatic Tool Co.

Drills (Hand Hammer)
*Chicago Pneumatic Tool Co.

Drills (Rock)
*Chicago Pneumatic Tool Co.

Drills (Sinking)
*Chicago Pneumatic Tool Co.

Drills (Stoping)
*Chicago Pneumatic Tool Co.

Drills (Wagon)
*Bucyrus-Erie Co.
*Chicago Pneumatic Tool Co.

Drills (Water Well)
*Bucyrus-Erie Co.

Drills (Well) (See Drills—Blast-Hole)

Drives (Multiple Belt, Chain, Rope)
*Allis-Chalmers Mfg. Co.

Dryers
*Allis-Chalmers Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mch. Co.
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Dust Arresters
*Blaw-Knox Co.
Buell Engineering Co.
*Dracco Corp.
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Collecting Systems
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
*Blaw-Knox Co.
Buell Engineering Co.
*Dracco Corp.
*Parsons Engineering Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Western Precipitation Corp.

Dust Conveying Systems
Allen-Sherman-Hoff Co.
*Blaw-Knox Co.
Buell Engineering Co.
*Dracco Corp.
*Fuller Company
*Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Filters
Buell Engineering Co.
Parsons Engineering Corp.
*Western Precipitation Corp.

Dust Handling Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Dynamite (See Explosives)

Electrical Equipment
*Allis-Chalmers Mfg. Co.

Electrodes (Welding)
Stulz-Sickles Co.

Elevator Belting (See Belting)

Elevator Buckets (See Buckets—Elevator and Conveyor)

Elevators (See Conveyors and Elevators)

Eliminators (Soft Stone) (See Soft Stone Eliminators)

Engineers
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
*Fuller Company
Hetherington & Berner, Inc.
*Kennedy-Van Saun Mfg. and Eng. Corp.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
Strong-Scott Mfg. Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.
Wellman Engineering Co.

Engine Generator Sets
See Generator Sets (Engine).

Engines (Diesel)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.

Engines (Internal-Combustion)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.

Engines (Steam)
Maddox Fdry. & Machine Works
*Morris Machine Works
*Nordberg Mfg. Co.

Excavating Machinery (See Shovels; Cranes; Buckets, etc.)

Excavators—Shallow Grading (Bucket Elevator Type)
*Haiss Mfg. Co., Geo.

Fabricating (Electric Arc and Oxy-Acetylene)
Stulz-Sickles Co.

Fans (Exhaust)
*Kennedy-Van Saun Mfg. and Eng. Corp.

Feeders
*Allis-Chalmers Mfg. Co.
*Fuller Company
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
Maddox Fdry. & Machine Works
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.
*Traylor Engr. & Mfg. Co.

Floor Sweeping Systems (Hydro Vacuum)
Allen-Sherman-Hoff Co.

Fuses (Detonating)
*Ensign-Bickford Co.

Gas Producers
Wellman Engineering Co.

Gaskets
Goodyear Tire & Rubber Co.

Gasoline Engines (See Engines—Internal-Combustion)

Gates (Bin) (See Bin Gates)

Gates (Clamshell)
*Haiss Mfg. Co., Geo.
*Link-Belt Co.

Gears (Herringbone)
*Link-Belt Co.
Maddox Fdry. & Machine Works
*Sprout, Waldron & Co.

Gears and Pinions
*Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Maddox Fdry. & Machine Works
*Sprout, Waldron & Co.

Gelatin (See Explosives)

Generators (See Motors and Generators)

Glass Sand Equipment
Lewistown Foundry & Machine Co.

Grab Buckets (See Buckets—Clamshell, Orange - Peel, etc.)

Grapples
Owen Bucket Co.

Grates (Boiler)
Maddox Fdry. & Machine Works

Grating (Steel)
*Blaw-Knox Co.
*Hendrick Mfg. Co.

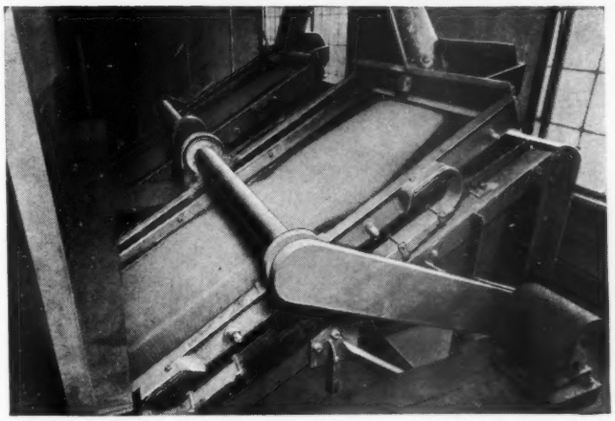
Grinding Balls (See Balls, Grinding)

Grizzly Feeders
*Traylor Engr. & Mfg. Co.

Grizzlies
*Allis-Chalmers Mfg. Co.
*Eagle Iron Works
*Hendrick Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mach. Co.
Maddox Fdry. & Machine Works
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Smith Engr. Works

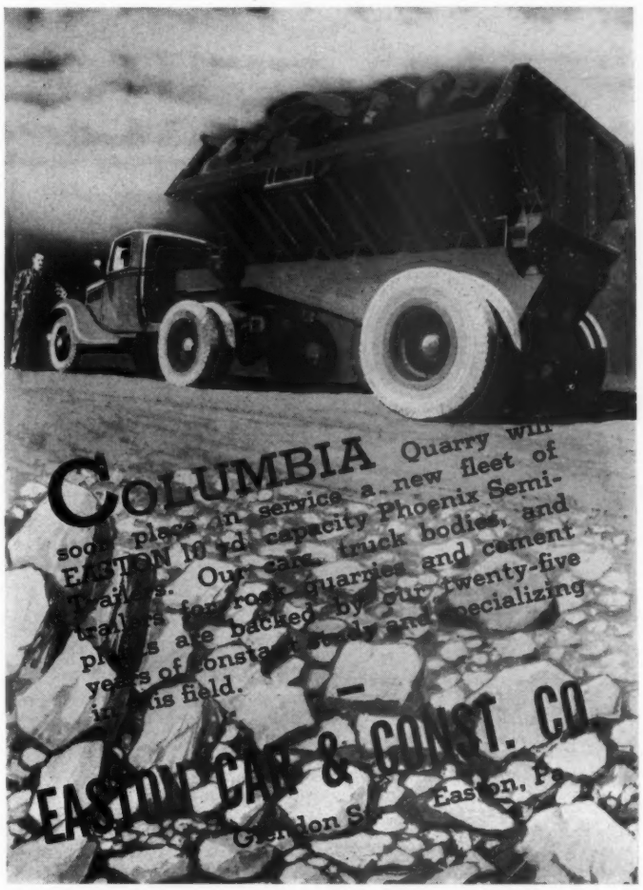
* See also information in the 1938 Pit and Quarry HANDBOOK.

VIBRATING SCREENS by LINK-BELT



Made in several types, for screening sand, gravel, crushed stone, coal, coke, clay, lime, fertilizer, ores, grain, sugar, chemicals, pulpwood chips, etc. Send for Catalog No. 1562. Address Link-Belt Company, Philadelphia, Chicago, Indianapolis, Atlanta, San Francisco, or any of our offices, located in principal cities.

P-7520



BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

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Guards (Wire)
Manganese Steel Forge Co.
National Wire Cloth Co.

Guns (Hydraulic)
Hetherington & Berner, Inc.
Taylor Forge & Pipe Works

Hammer Mills (See Crushers—Hammer)

Heaters (Bitumen)
*Easton Car & Construction Co.

Hitchings (Links, Pins, Clevises)
Sanford-Day Iron Works

Hoists
*Chicago Pneumatic Tool Co.
Hetherington & Berner, Inc.
*Jaeger Machine Co.
*Link-Belt Co.
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
*Sauerman Bros., Inc.
Smith Engr. Works
*Sprout, Waldron & Co.

Hoppers
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Hose (Air, Steam and Water)
*Chicago Pneumatic Tool Co.
Gates Rubber Co.
Goodyear Tire & Rubber Co.

Hose Couplings (See Couplings)

Hose (Petroleum)
Gates Rubber Co.

Hose (Radiator-Engine Cooling)
Gates Rubber Co.
Goodyear Tire & Rubber Co.

Hulls (Steel)
Maddox Fdry. & Machine Works

Hydraulic Guns (See Guns—Hydraulic)

Idlers
*Allis-Chalmers Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
Smith Engr. Works
*Sprout, Waldron & Co.

Indicators (Material Level)
*Fuller Company

Jigs
Maddox Fdry. & Machine Works

Joist and Slab Machines (Concrete)
R & L Concrete Machinery Co.

Kilns and Coolers (Rotary)
*Allis-Chalmers Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Kominuters
*Smidth & Co., F. L.

Ladders (Agitating Dredge)
*Eagle Iron Works
Maddox Fdry. & Machine Works

Ladders (Hydraulic Dredge)
*Eagle Iron Works
Maddox Fdry. & Machine Works

Lime and Hydrating Plants
Lime & Hydrate Plants Co.

Lime-Handling Equipment
*Fuller Company
Lime & Hydrate Plants Co.
*Link-Belt Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Robins Conveying Belt Co.
*Traylor Engr. & Mfg. Co.

Lime Kilns
*Kennedy-Van Saun Mfg. and Eng. Corp.

Linings (Ball- and Tube-Mill) (See Mill Liners and Linings)

Loaders and Unloaders
*Bucyrus-Erie Co.
*Fuller Company
*Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.
*Sprout, Waldron & Co.

Locomotives (Diesel)
*Whitcomb Locomotive Co.

Locomotives (Diesel-Electric)
*Whitcomb Locomotive Co.

Locomotives (Gas-Electric)
*Whitcomb Locomotive Co.

Locomotives (Oil-Electric)
*Whitcomb Locomotive Co.

Magnetic Pulleys (See Pulleys, Magnetic)

Manganese Steel
Manganese Steel Forge Co.

Manganese Steel (Plates and Sheets)
Manganese Steel Forge Co.

Mechanical Rubber Goods
Gates Rubber Co.
Goodyear Tire & Rubber Co.

Mill Liners and Linings
*Kennedy-Van Saun Mfg. and Eng. Corp.
Maddox Fdry. & Machine Works
*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

Mills (Ball, Tube, etc.)
*Traylor Engr. & Mfg. Co.

Mills (Grinding) (See also Crushers—Hammer)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Brooks Equip. & Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Fdry. & Mach. Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
*Sprout, Waldron & Co.
Strong-Scott Mfg. Co.
*Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Mixers
Multiplex Concrete Machinery Co.

Motors & Generators
*Allis-Chalmers Mfg. Co.

Motors (Internal-Combustion) (See Engines — Internal-Combustion)

Moulds and Forms (Concrete)
Dunn Mfg. Co., W. E.
Multiplex Concrete Machinery Co.
R & L Concrete Machinery Co.

Netting (Locomotive Stack)
*Tyler Co., W. S.

Nozzles (Gravel Washing)
*Deister Concentrator Co.

Nozzles (Hydraulic) (See Guns—Hydraulic)

Nozzles (Spray)
*Deister Concentrator Co.

Packings
Goodyear Tire & Rubber Co.

Pallets
Multiplex Concrete Machinery Co.

Partitions (Wire)
National Wire Cloth Co

Paving Mixers
*Jaeger Machine Co.
*Koehring Co.

Perforated Metal Plates
*Allis-Chalmers Mfg. Co.
Chicago Perforating Co.
*Hendrick Mfg. Co.
*Sprout, Waldron & Co.

Pipe, Dredge (Floating and Shore)
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Flanges
Hetherington & Berner, Inc.
Naylor Pipe Co.
Taylor Forge & Pipe Works

Pipe Fittings
Hetherington & Berner, Inc.

Pipe Forms (Concrete)
Quinn Wire & Iron Works
R & L Concrete Machinery Co.

Pipe Machines (Concrete)
Quinn Wire & Iron Works
R & L Concrete Machinery Co.

Pipe (Spiral)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Pipe (Water, Gas, Low Pressure Steam)
Hetherington & Berner, Inc.

Pipe (Welded)
Naylor Pipe Co.
Taylor Forge & Pipe Co.

Plants (Aggremeter) (See Aggremeter Plants)

Plug Valves (See Valves)

Pneumatic Conveying Systems (See Conveyors—Pneumatic)

Pneumatic Drills (See Drills, Rock)

Portable Conveyors
*Fuller Company
Haiss Mfg. Co., Geo.
*Link-Belt Co.
*Robins Conveying Belt Co.

Portable Crushing and Screening Plants
Brooks Equip. & Mfg. Co.
*Gruendler Crusher & Pulverizer Co.
Maddox Fdry. & Machine Works
*Williams Patent Crusher & Pulverizer Co.

Portable Engines (See Engines—Internal Combustion)

Portable Loaders (See Loaders and Unloaders)

Powder, (Black, Blasting) (See Explosives)

Power Shovels (See Shovels, Electric, Internal-Combustion and Steam)

Power Tampers (Concrete)
Multiplex Concrete Machinery Co.

Power Units (Internal-Combustion)
Caterpillar Tractor Co.
*Chicago Pneumatic Tool Co.
*Nordberg Mfg. Co.

Precipitators
*Western Precipitation Corp.

Pre-formed Wire Rope
Broderick & Bascom Rope Co.
*Hazard Wire Rope Division of The American Chain & Cable Co., Inc.
*Leschen & Sons Rope Co., A.

Presses (Hydraulic)
Maddox Fdry. & Machine Works

Press Machines (Hand, Concrete)
Multiplex Concrete Machinery Co.

Proportioning Equipment
*Blaw-Knox Co.
*Jaeger Machine Co.

Pulleys
Maddox Fdry. & Machine Works
Sprout, Waldron & Co.

Pulleys (Magnetic)
*Sprout, Waldron & Co.

Pulleys (Wing)
*Sprout, Waldron & Co.

Pulverized Fuel Systems
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.

Pulverizers (See also Crushers, Mills, etc.)
*Allis-Chalmers Mfg. Co.
*American Pulverizer Co.
*Brooks Equip. & Mfg. Co.
*Gruendler Crusher & Pulverizer Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
New Holland Machine Co.
*Raymond Pulverizer Div. of Combustion Engr. Co., Inc.
*Smidth & Co., F. L.
Strong-Scott Mfg. Co.
Sturtevant Mill Co.
Traylor Engr. & Mfg. Co.
*Williams Patent Crusher & Pulverizer Co.

Pump Valves (See Valves, Pump)

Pumps (Air-Lift)
*Chicago Pneumatic Tool Co.
*Fuller Company

Pumps (Bulk Cement)
*Fuller Company

Pumps (Cement Slurry)
Allen-Sherman-Hoff Co.
*Morris Machine Works
*Smidth & Co., F. L.

Pumps (Centrifugal)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
*Jaeger Machine Co.
Kansas City Hay Press Co.
Maddox Fdry. & Machine Works
*Morris Machine Works

Pumps (Dewatering)
Erie Pump & Engine Works
*Morris Machine Works

Pumps (Dredging)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Bucyrus-Erie Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
Maddox Fdry. & Machine Works
*Morris Machine Works

Pumps (Sand and Gravel)
Allen-Sherman-Hoff Co.
*Allis-Chalmers Mfg. Co.
Erie Pump & Engine Works
Hetherington & Berner, Inc.
Kansas City Hay Press Co.
Maddox Fdry. & Machine Works
*Morris Machine Works

Pumps (Sump)
*Chicago Pneumatic Tool Co.

* See also information in the 1938 Pit and Quarry HANDBOOK.

EAGLE "SWINTEK"

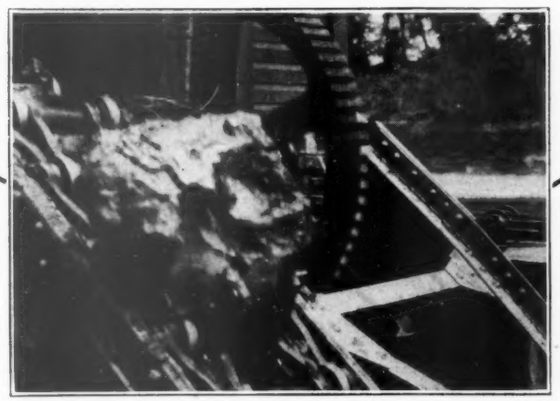
SCREEN NOZZLE LADDER

Eliminates costly delays and irregular production due to suction line becoming clogged with boulders or debris from the deposit. Speed up production and incidentally *boost your profits* with the EAGLE "SWINTEK" NOZZLE LADDER. It insures an even flow of solids by loosening and agitating the deposit with a screen chain which also carries away everything that might otherwise clog the nozzle.

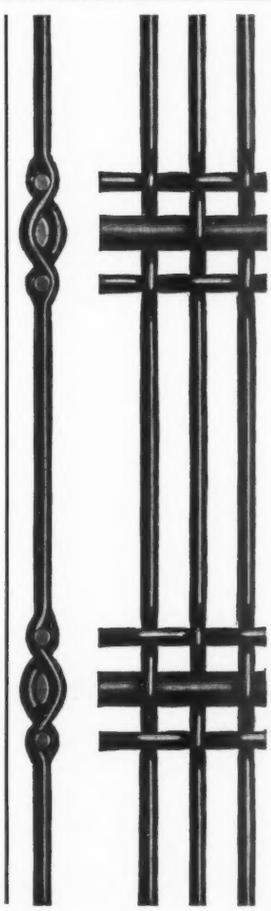
The EAGLE "SWINTEK" NOZZLE LADDER means CONTINUOUS OPERATION — GREATER OUTPUT — MORE PROFIT! Full information on request.

EAGLE IRON WORKS • DES MOINES, IOWA

FOR CLEAN SAND AND GRAVEL USE EAGLE WASHERS



SEND FOR EAGLE "SWINTEK" AND WASHER BULLETIN



STA-TRU

Long-Mesh Woven Wire Screens

made to work under tension and vibration.

The straight stay - bars carry ALL the tension. The crimps in the round wires can not be stretched or broken. The screen can not be caused to sag or split by the pull of the tensioning device.

LUDLOW-SAYLOR WIRE CO. ST. LOUIS

ALLIGATOR

TRADE MARK REG. U.S. PAT. OFFICE

STEEL BELT LACING

JUST A HAMMER TO APPLY IT
The compression grip protects belt ends.
Made with precision. Drives straight.
Smooth on both faces. Embeds in belt.
For all belts—all speeds. Flexible.
Rocker Hinge Pin. Separable joint.
Great strength. Long life.
REG. U. S. PAT. OFF.
"Never Lets Go"
ALLIGATOR
DISTRIBUTORS
12 Sizes in Standard Boxes.

Made also in "Monel Metal" and non-magnetic alloy for special service, and in long lengths for wider belts.

Sole Manufacturers

FLEXIBLE STEEL LACING CO.

4623 Lexington Street Chicago, Illinois

In England at **15 Westmoreland Place, LONDON, N. I.**

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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Pumps (Turbine)
Erie Pump & Engine Works
*Morris Machine Works

Pumps (Vacuum)
*Chicago Pneumatic Tool Co.
*Fuller Company

Pumps (Vertical)
Erie Pump & Engine Works
*Morris Machine Works

Pumps (Well)
Erie Pump & Engine Works
*Morris Machine Works

Racks (Curing)
Multiplex Concrete Machinery Co.

Ready-Mixed Concrete Plants
*Jaeger Machine Co.

Rock Drills (See Drills—Rock)

Rod Mills
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Rods (Welding)
Gilmore Wire Rope Div. of Jones & Laughlin Steel Corp.
Stulz-Sickles Co.

Rope (Wire) (See Wire Rope)

Sand and Gravel Handling Equipment
*Link-Belt Co.

Sand Separators
*Link-Belt Co.
McLanahan and Stone Corp.
Simplicity Engr. Co.
Smith Engr. Works

Sand-Settling Tanks
*Link-Belt Co.
*Nordberg Mfg. Co.
Smith Engr. Works

Scrapers (Power Drag)
Continental Roll & Steel Fdry. Co.
*Link-Belt Co.
*Sauerman Bros., Inc.

Scrapers (Wagon)
*Bucyrus-Erie Co.
Continental Roll & Steel Fdry. Co.

Screens
*Allis-Chalmers Mfg. Co.
Bacon, Inc., Earle C.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
*Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Ludlow-Saylor Wire Co.
Maddox Fdry. & Machine Works
Manganese Steel Forge Co.
McLanahan and Stone Corp.
National Wire Cloth Co.
*Nordberg Mfg. Co.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Gruendler Crusher & Pulverizer Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machine Co.
*Link-Belt Co.
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
New Holland Machine Co.
*Nordberg Mfg. Co.
*Robins Conveying Belt Co.
Screen Equipment Co.
Simplicity Engr. Co.
Smith Engr. Works
*Sprout, Waldron & Co.
Sturtevant Mill Co.
*Tyler Co., W. S.
*Williams Patent Crusher & Pulverizer Co.

Scrubbers
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Semi-Trailers (Side or End-Dumping, Quarry)
*Easton Car & Construction Co.

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Separators (Slurry)
*Smidth & Co., F. L.

Sheaves
*Allis-Chalmers Mfg. Co.
*Eagle Iron Works
Gates Rubber Co.
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Maddox Fdry. & Machine Works
McLanahan and Stone Corp.
Sanford-Day Iron Works
*Sprout, Waldron & Co.

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*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Koehring Co.
*Link-Belt Co.
Thew Shovel Co.

Silos
*Smidth & Co., F. L.

Skids
*Easton Car & Construction Co.

Skip Hoists and Skips
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Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Link-Belt Co.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
*Link-Belt Co.
*Sprout, Waldron & Co.

Stacks (Smoke)
Maddox Fdry. & Machine Works

Steel (Alloy) (See Alloys—Steel)

Steel (High Tensile)
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Manganese Steel Forge Co.

Steel (Open Hearth)
Gilmore Wire Rope Div. of Jones & Laughlin Steel Corp.
Manganese Steel Forge Co.

Steel Grating (See Grating, Steel)

Steel Plate Construction
Gilmore Wire Rope Div. of Jones & Laughlin Steel Corp.
Hetherington & Berner, Inc.
Manganese Steel Forge Co.
*Sprout, Waldron & Co.

Stone Grapples
Owen Bucket Co.

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*Link-Belt Co.
*Sauerman Bros., Inc.

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Allen-Sherman-Hoff Co.

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*Link-Belt Co.
Maddox Fdry. & Machine Works
*Traylor Engr. & Mfg. Co.

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Smith Engr. Works

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*Tyler Co., W. S.

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Caterpillar Tractor Co.

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Sanford-Day Iron Works

Trailers (Industrial & Quarry)
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*Allis-Chalmers Mfg. Co.

Transmission Belting (See Belting)

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*Gruendler Crusher & Pulverizer Co.
*Link-Belt Co.

Trippers
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Jaeger Machine Co.

Trucks (Industrial Electric and Gas Electric)
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*Easton Car & Construction Co.

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*Link-Belt Co.

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Taylor Forge & Pipe Works

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Chicago Perforating Co.
*Hendrick Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

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*Tyler Co., W. S.

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Continental Roll & Steel Fdry. Co.

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*Koehring Co.

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*Eagle Iron Works
*Haiss Mfg. Co., Geo.
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Manganese Steel Forge Co.
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Worm Gears (See Gears and Pinions)

*** See also information in the 1938 Pit and Quarry HANDBOOK.**

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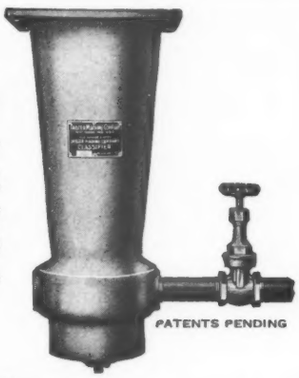
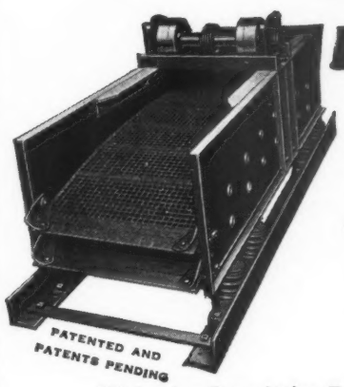
For sizing minus 5/16" gravel and sand, and for cleaning it by washing out silt and other light impurities.

Descriptive Bulletin No. 23





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VIBRATING SCREEN

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DEISTER MACHINE COMPANY

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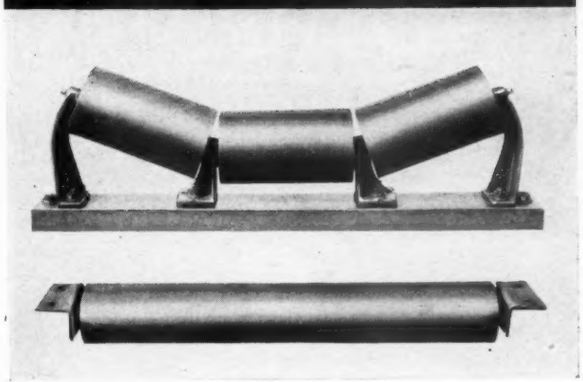

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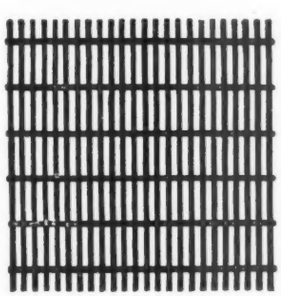

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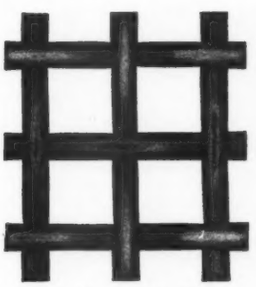
"CLEVELAND" SCREENS

A wire cloth of guaranteed accuracy backed by fine workmanship and an effort to satisfy.

Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



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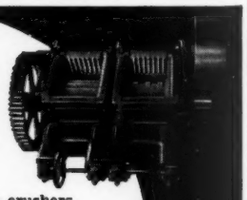

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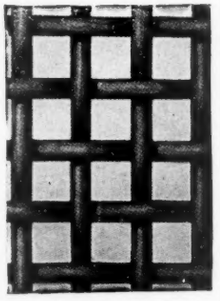

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★ Maintains accuracy throughout life of screen

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Attractive Prices
Immediate Shipments from Stock

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- ☐ Air compressors
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- ☐ Asphalt Mixers
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- ☐ Bags, cloth
- ☐ Bags, paper
- ☐ Balls, steel
- ☐ Barges, steel
- ☐ Belt Dressing
- ☐ Belt fasteners
- ☐ Belting, conveyor and elevator
- ☐ Belting, transmission
- ☐ Belt lacing
- ☐ Belt plates
- ☐ Belt rivets
- ☐ Belt tighteners
- ☐ Bin gates
- ☐ Bins, concrete
- ☐ Bins, steel
- ☐ Blasting supplies
- ☐ Blasting powder
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- ☐ Bodies, Motor Trucks
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- ☐ Buckets, Conveyor and Elevator
- ☐ Buckets, Dragline
- ☐ Buckets, Orange Peel
- ☐ Cableways, Slackline
- ☐ Calcining Machinery
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- ☐ Cars, Dump
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- ☐ Castings, Manganese Steel
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- ☐ Cranes, Truck
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- ☐ Crushers, Hammer
- ☐ Crushers, Jaw
- ☐ Crushers, Ring
- ☐ Crushers, Roll
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- ☐ Draglines, Cableway
- ☐ Draglines, Revolving Boom
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- ☐ Dredges, Ladder
- ☐ Drill Sharpening Machinery
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- ☐ Stokers
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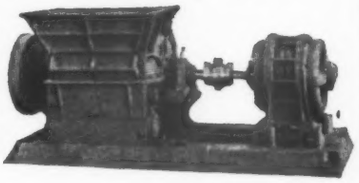

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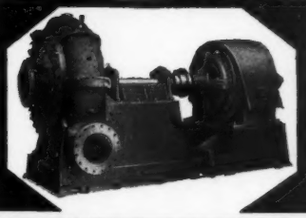

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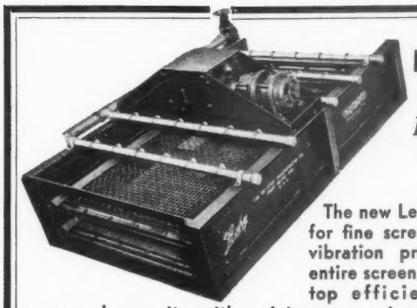

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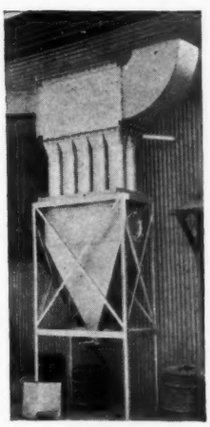

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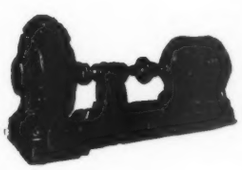

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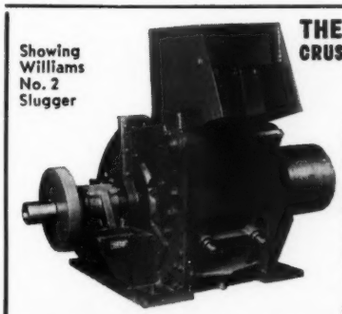

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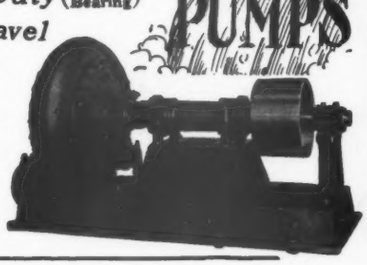

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